59. The shaft 11 may be rotated by the engine and the shaft 73 rotated to raise or to lower the lawn mower units, as desired. The variable speed gearing may be shifted to positions to propel the machine rearwardly at one speed, or forwardly at either of two selected speeds, as desired. The gear 59 may slide forwardly along the shaft 11 to release the clutch member 58 from the clutch member 57 should the gear 59 be held from rotating by the gear segment 60. Thus the spring 65 performs the several functions of closing the clutch 58—57, permitting the gear 59 to move toward the gear 64 to disengage the clutch member 58 from the clutch member 57, causing the gear 64 to rotate with the shaft 11, and permitting the shaft 11 to rotate while the gear 64 remains stationary should occasion exist for such operation.

After the motor has been started, the reverse and variable speed gearing may be operated by turning the shaft 22 in the manner already described as required to move the gears 30 and 31 along the shaft 11 into mesh with the respective cooperating gears of the variable speed gearing.

Due to the pivotal connection of the various mower units with the operating frame, the machine may easily be guided and turned from one direction to another. When it is desired to raise the lawn mowers from the surface of the ground, it is only necessary to close the clutch 74—75 and rotate the shaft 73, thus moving the block 86 along the shaft 73 and operating the various flexible cable connections to the respective mowers and thereby raising the mowers from the ground. The mowers may be held suspended by engaging the block 86 in the notch 94 and the machine may be propelled along the ground while all the mowers remain suspended and unoperated. The mowers will be held from oscillation by the conical retainer members 124. When it is desired to operate the mowers, it is only necessary to release the notch 94 from the block 86 and permit the shaft 73 to rotate.

From the foregoing, it is apparent that my improved lawn mower machine is specially designed and adapted for use in mowing the putting greens and fairways of golf links, although the machine may be satisfactorily used in mowing other vegetation. The spaces between the three lawn mowers 98, 99 and 100 are spanned by the two lawn mowers 96 and 97 at the front, so that the strips or swaths cut by the respective lawn mowers overlap. In this way, no strips of uncut vegetation are left even though many irregularities in the surface of the ground are encountered.

The machine may be varied in many particulars without departure from the nature and principle of the invention. For instance, the particular type of motor and the particular type of variable speed gearing employed are unimportant, the principal features of the invention comprising the series of lawn mowers and any appropriate mechanism for operating them in approximately the relationship and for the purposes described. Accordingly, I do not restrict myself to the use of any specific type of motor or any specific type of driving gear as I contemplate varying these features while retaining essential features of the invention.

I claim:

1. A machine of the character described comprising a frame having front and rear ends, a pair of differentially rotative axle shafts supporting said frame approximately midway of its ends, a wheel attached to the outer end of each of said shafts for supporting and propelling said frame, a motor and transmission mechanism driven thereby supported approximately midway of the ends of said frame above said axle shafts for rotating said shafts and thereby said wheels to propel said frame, laterally spaced lawn mowers in front of said wheels pivotally connected with the front end of said frame and extending across and laterally beyond the lines of travel of said wheels, and a series of laterally spaced lawn mowers pivotally connected with the rear of said frame rearwardly of said wheels for mowing strips between and at the sides of the strips mowed by said lawn mowers at the front end of said frame.

2. A machine of the character described comprising a frame having front and rear ends, a pair of differentially rotative axle shafts supporting said frame approximately midway of its ends, a wheel attached to the outer end of each of said shafts for supporting and propelling said frame, a motor and transmission mechanism driven thereby supported approximately midway of the ends of said frame above said axle shafts for rotating said shafts and thereby said wheels to propel said frame, laterally spaced lawn mowers in front of said wheels pivotally connected with the front end of said frame and extending across and laterally beyond the lines of travel of said wheels, a series of laterally spaced lawn mowers pivotally connected with the rear of said frame rearwardly of said wheels for mowing strips between and at the sides of the strips mowed by said lawn mowers at the front end of said frame, and mechanism operated by said motor for raising and supporting all of said lawn mowers above the ground.

3. A machine of the character described comprising a frame, mechanism for propelling said frame, a series of lawn mowers pivotally connected with the front end of and operated by said frame to mow a swath in advance of and wider than the path traveled by said propelling mechanism, and means operated by said propelling mechanism for raising and supporting said lawn mowers in connection with said frame above the ground.

4. A machine of the character described comprising a frame, mechanism for propelling said frame, a number of lawn mowers operatively connected with said frame, a rotary shaft mounted in said frame, means for rotating said shaft by said mechanism, an element movable longitudinally by and along said shaft, and means operated by said element for raising and supporting said lawn mowers above the ground.

5. A machine of the character described comprising a frame, mechanism for propelling said frame, a number of lawn mowers operatively connected with said frame, a rotary shaft mounted in said frame, means for rotating said shaft by said mechanism, means operated by said shaft for raising and supporting said lawn mowers above the ground, and devices supported by said frame for preventing substantial oscillation of said lawn mowers when said lawn mowers are supported above the ground.

6. In a machine of the character described, supporting wheels, a frame, mechanism mounted on said frame for rotating said wheels, a series of lawn mowers in front of said wheels pivotally connected with said frame and extending across and laterally beyond the lines of travel of said wheels, mechanism supported by said frame for raising and supporting said lawn mowers above the ground, and means for operating said last

named mechanism by said first named mechanism as desired.

7. In a machine of the character described, a wheel supported frame, a series of lawn mowers pivotally connected with said frame for oscillation in every direction, and mechanism supported by said frame for propelling said frame and raising and supporting said lawn mowers above the ground.

8. In a machine of the character described, a frame, wheels supporting said frame, two series of lawn mowers pivotally connected with said frame for relative vertical and horizontal oscillation for operation thereby, and mechanism supported by said frame for propelling said frame and raising and supporting said lawn mowers above the ground.

9. In a machine of the character described, a frame, wheels supporting said frame, a number of lawn mowers at the front of said frame extending across and laterally beyond the lines of travel of said wheels, a series of lawn mowers at the rear of said frame, means for operating said lawn mowers by said frame, and mechanism supported by said frame for rotating said wheels and raising and supporting said lawn mowers above the ground.

10. In a machine of the character described, a frame, wheels supporting said frame, a number of alined lawn mowers pivotally connected with said frame in front of and extending laterally beyond the lines of travel of said wheels, a rotary shaft in said frame, a movable member mounted on said shaft, connections from said lawn mowers to said movable member for raising and supporting said lawn mowers above the ground, and power mechanism supported by said frame for rotating said wheels and said shaft and operating said movable member to raise said lawn mowers above the ground.

11. In a machine of the character described, a frame, wheels supporting said frame, a number of lawn mowers operatively connected with said frame, a rotary shaft, mechanism for rotating said shaft continuously in one direction, an element movable longitudinally by and along said shaft, connections operated by said element for raising and supporting said lawn mowers above the ground during rotation of said shaft in one direction, and means for holding said shaft against rotation.

12. In a machine of the character described, a frame, wheels supporting said frame, a number of lawn mowers operatively connected with said frame in front of said wheels, a rotary shaft mounted in said frame, a movable member supported by said frame, means for moving said movable member alternately in opposite directions by continuous rotation of said shaft in one direction, and connections from said lawn mowers to said movable member for raising and supporting said lawn mowers above the ground.

13. In a machine of the character described, a frame, wheels supporting said frame, a motor mounted on said frame, mechanism for rotating said wheels by said motor, a series of lawn mowers operatively connected with said frame, a rotary shaft supported by said frame, slip clutch mechanism for rotating said shaft by said motor, and mechanism operated by said shaft for raising and supporting said lawn mowers above the ground.

14. In a machine of the character described, a frame, wheels supporting said frame, a series of lawn mowers pivotally connected with said frame for operation thereby, mechanism for raising and supporting said lawn mowers above the ground, and means other than said mechanism holding said lawn mowers from substantial oscillation when they are supported above the ground.

15. In a machine of the character described, a frame, a vertical member attached to said frame, a sleeve mounted for sliding movements vertically along said member, a lawn mower unit, means pivotally connecting said lawn mower unit with said sleeve, and mechanism supported by said frame for raising said lawn mower unit above the ground.

16. In a machine of the character described, a frame, a vertical member attached to said frame, a sleeve mounted for sliding movements vertically along said member, a lawn mower unit, means pivotally connecting said lawn mower unit with said sleeve, mechanism supported by said frame for raising said lawn mower unit above the ground, and means for holding said lawn mower unit substantially from oscillation during the time that it is supported above the ground by said mechanism.

17. In a machine of the character described, a frame, wheels supporting said frame, a series of lawn mower units connected with said frame for operation thereby, a motor for propelling said frame, mechanism mounted in said frame for raising said lawn mower units above the ground, and slip clutch mechanism for operating said mechanism by said motor to raise said lawn mower units and leaving said mechanism stationary after said lawn mower units have been raised.

18. In a machine of the character described, a frame, wheels supporting said frame, a series of lawn mower units connected with said frame for operation thereby, a motor for propelling said frame, mechanism mounted in said frame for raising said lawn mower units above the ground, slip clutch mechanism for operating said mechanism by said motor to raise said lawn mower units and leaving said mechanism stationary after said lawn mower units have been raised, and members for holding said lawn mower units substantially stationary in their raised positions.

19. A machine of the character described comprising a frame, wheels supporting said frame, a rotary shaft in said frame, a motor supported by said frame, gearing for rotating said wheels by said motor, slip clutch mechanism for rotating said shaft by said motor, a series of lawn mower units connected with said frame for operation thereby, connections operated by said shaft for raising said lawn mower units above the ground, and means for preventing rotation of said shaft by said slip clutch mechanism during the time that said lawn mower units are supported above the ground.

20. A machine of the character described comprising a wheel supported frame, lawn mower units operatively connected with said frame, a rotary shaft supported by said frame, mechanism for rotating said shaft, connections operated by said shaft for raising said lawn mower units, elements for preventing oscillation of the lawn mower units during the time they are raised above the ground, and means for operating said mechanism by said shaft to position to permit said lawn mower units to descend to the ground.

JOHN BAPTISTE POL.

April 18, 1950 F. M. FORD 2,504,259

MOWER

Filed July 15, 1947

Fig. 1.

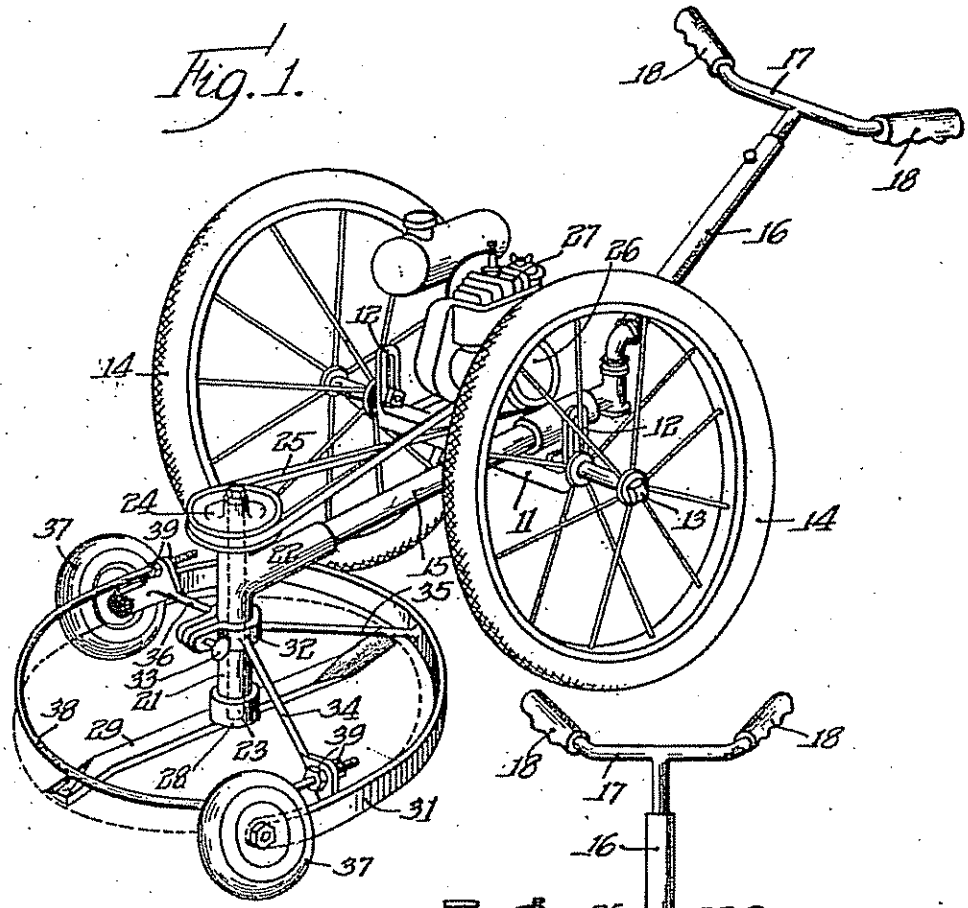
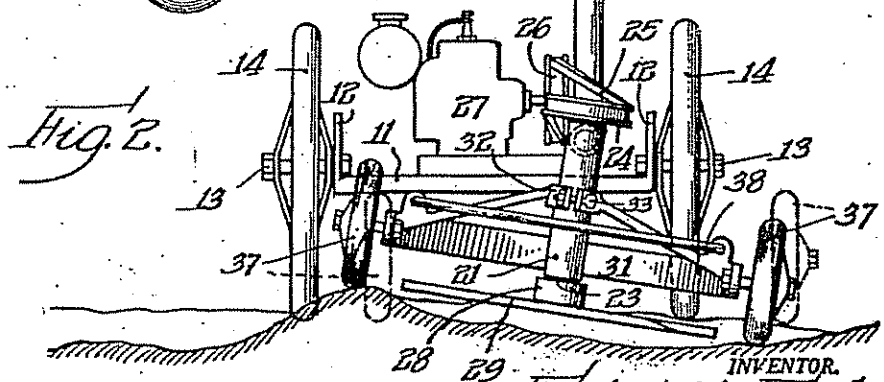


Fig. 2.



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UNITED STATES PATENT OFFICE

2,504,259

MOWER

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Application July 15, 1947, Serial No. 761,130

5 Claims. (Cl. 56—25.4)

1

The present invention which relates to certain innovatory structural benefits and resulting functional advantages in vegetation mowers, such as those employed for cutting grass and other growing plants, concerns more particularly distinct advantages and refinements in the means incorporated in such appliances for performing their required work, and more particularly in mowing the plant life on terrains of varying surface slopes and angles.

An outstanding and paramount aim or object of this invention is to provide equipment of that type capable of satisfactorily performing the mowing operation under the conditions specified which is relatively simple in structure, which is comparatively economical to make, which is especially efficient in service, which is easy to operate, which is unlikely to become damaged or injured in ordinary service, etc.

In order that those acquainted with or skilled in this art may have a full and complete understanding of the invention and the several benefits and advantages accruing from its employment, a present preferred embodiment thereof has been illustrated in the accompanying drawing, forming a part of this specification, and to which reference should be had in connection with the following detailed description of the appliance portrayed therein.

In this drawing, in which like parts in the views have been supplied with the same reference numerals—

Figure 1 is a perspective view of the novel mower as seen more or less from the front of the apparatus; and

Figure 2 is a front elevation of the mower on a somewhat smaller scale and shows the device cutting on sloping ground in full lines and on level ground in dotted lines.

Referring to this drawing, it will be noted that the device includes a transverse, main supporting-bar 11 with vertically slotted, upturned ends 12, 12 which adjustably accommodate bolts 13, 13 on which are rotatably mounted the ground engaging carrying-wheels 14, 14.

Suitably fixedly secured in any approved manner on such cross-element 11 is a forwardly extended, practically horizontal, tube 15 at the rear end of which is fixed the lower portion of a handle-shank 16 in the top end of which is adjustably secured the stem of a handle 17 equipped with a pair of hand-grips 18, 18 by means of which the mower may be pushed forwardly and at the same time conveniently steered.

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At the front end of tube 15 is an upright bearing-member 21, an integral horizontal shank 22 of which is telescoped with and rockingly mounted on the part 15 so that the bearing 21 is adapted to oscillate transversely of the mower in a substantially vertical plane.

This bearing 21 accommodates an upright rotary shaft 23, depicted only by dotted lines whose protruding upper end is fitted with a substantially horizontally, peripherally grooved pulley 24 rotated by its crossed-belt 25 power driven by a vertically disposed pulley 26 of an internal-combustion motor 27 also suitably mounted on the cross-bar 11.

The lower projecting end of shaft 23 has fixedly secured thereon the hub 28 of a rotary cutter or mowing bar 29 the opposite ends of which are shaped and sharpened as illustrated to perform the grass or weed cutting operation.

Protecting the rear half of the circular path of travel of the two sharpened ends of cutter-bar 29 and of slightly larger diameter than the length of such bar is a practically semi-circular guard-bar 31 which is supported by a split hub 32 vertically adjustably mounted on the exterior of bearing 21 and capable of being tightened manually in place in different heighth positions by a set-screw 33, this element 31 being supported from such member 32 by a plurality of downwardly sloping radial elements or bars 34, 35 and 36 welded to such element 31.

The forwardly extended, parallel, end portions of such approximately semi-circular protector-bar 31 rotatably carry a pair of relatively small, transversely registered, ground-engaging, rubber-tired wheels 37, 37 and the two supports 34 and 36 have adjustably mounted in apertures therethrough the screw-threaded, terminal sections of a virtually semi-circular fender rod 38 adjustably held in place on such members by nuts 38, 39.

This curved rod 38 located at a higher level than the cutter-bar 29 and positioned within the ends of such revolving shearing blade which performs the cutting action below such part 38 thus determines the degree of approach of the cutter-blade with relation to obstructions, such as trees, shrubs, etc.

From what precedes it will be understood that as the mower supported by the four wheels is pushed forwardly by the operator by means of the rearwardly extended handle the cutter-blades are revolving by reason of the described connecting mechanism by the internal-combustion engine, or by an electric-motor if that is pre-

ferred, the depth of the cut of the vegetation to be operated upon being determined by the vertical adjustment of the ground-wheels 14, 14 on the part 11 of the structure and also by the adjustment of the pair of smaller wheels on the bearing 21, but inasmuch as the terrain on which the carrying-wheels 37, 37 are traveling at any time as to slope of its surface may be more or less materially different from the shape of the ground surface on which the large wheels 14, 14 are traveling the cutting will occur to conform to the former condition of the ground because the smaller wheels will automatically follow the terrain and cause the cutting-blades to do likewise, as is clearly indicated in full lines in Figure 2.

Obviously, this is a distinct advantage in the mowing operation and so far as is known is a distinctly new feature in a mower of this general type.

Thus the operator of the mower secures an improved method and means for cutting the growth on all portions of the ground passed over by the mower, this being, so far as known, an outstanding novel feature of construction and operation which automatically changes the slope of the blades to conform to that of the ground on which they operate.

It is to be noted that the curved guard 31 always protects both blades of the cutting-bar when they are passing around their rear portion of travel because the guard is located outwardly beyond the ends of such blades and it is to be observed further that the degree of approach of the cutter-bar to any object along the front portion of its cutting action is adjustable because the front fender 38 may be enlarged or diminished in size by merely modifying the mountings of its ends in their supporting-means.

Those acquainted with this art will readily understand that the current invention is not necessarily limited and restricted to the precise details of structure set forth and that modifications thereof may be resorted to without departure from the heart and essence of the invention and without the loss of any of its material benefits and advantages.

For example, instead of having the bearing 21 rock on the tube 15 it could be rigid therewith provided the tube had a proper bearing, for instance, on the member 11.

I claim:

1. In a mower having a main body equipped with ground sustained carrying wheels, the combination of a handlebar mounted on said main body and located rearwardly thereof and by which the mower is manually propelled and also steered, a support mounted on said main body and projecting forwardly therefrom, a normally upright bearing mounted on said main body at the front portion of said support and by means of a horizontal bearing rotatable on a horizontal axis on the support, whereby said upright bearing may oscillate laterally of the direction of travel of the mower, a shaft rotatable on said upright bearing and movable therewith, a pulley fixed on the upper portion of said shaft, a motor on said main body, a pulley on and driven by said motor, an endless belt cooperating with said two pulleys to power rotate said shaft, a horizontal cutter bar mounted on and rotated by the lower portion of said shaft, a practically semi-circular guard bar of larger radius than one-half the length of said cutter bar located in substantially the horizontal plane of the cutter bar and outside of and adjacent the path of travel of the outer end of the revolving cutter bar in the rear portion of the path thereof, a hub adjustable lengthwise on said upright bearing and arms connecting said hub to said guard bar and supporting the latter in position, supplemental carrying wheels mounted on the opposite ends of said guard bar transversely of the direction of travel of the mower, and a fender rod at a higher level than and in front of said cutter bar and mounted adjustably on rods supporting the guard bar, whereby the cutter bar through its rotatable mounting on the support may be automatically tilted by the contour of the terrain by said supplemental wheels to conform at least approximately to the transverse ground surface over which the mower is passing and the vegetation of which it is cutting.

2. The mower construction set forth in claim 1, in which the pulley on the motor is in a substantially vertical plane and the pulley on the top of the shaft is in a substantially horizontal plane and an endless crossed drive belt, whereby the removal of such belt from the horizontal pulley permits the entire separation of the cutting portion of the mower from the main body of the mower and its ground wheels and handlebar.

3. A mowing machine comprising a frame supported on ground wheels, a member projecting forwardly from the frame, and an upright bearing carried by the front end of said member, an upright shaft rotatable in said upright bearing, a substantially horizontal cutter bar on the lower end portion of the shaft, a hub carried by the upright bearing and adjustable along the same, arms extending from the hub and inclined downwardly, a substantially semi-circular cutter bar guard carried by the arms and located in substantially the same horizontal plane with the cutter bar, ground wheels carried by the guard, a fender bar for the cutter bar, said fender being carried by some of the arms and projecting forwardly therefrom in a plane above the plane of the cutter bar, and means for driving the shaft.

4. A mowing machine comprising a frame supported on ground wheels, a bar projecting forwardly from the frame, an upright bearing having a lateral tubular shank rotatably mounted upon the front end of said bar, an upright shaft mounted in said upright bearing, a substantially horizontal cutter bar on the lower end portion of the shaft, a hub carried by the upright bearing and adjustable along the same, arms extending from the hub and inclined downwardly, a substantially semi-circular cutter bar guard carried by the arms and located in substantially the same horizontal plane with the cutter bar, ground wheels carried by the guard, a fender bar for the cutter bar, said fender being carried by some of the arms and projecting forwardly therefrom in a plane above the plane of the cutter bar, and means for driving the shaft.

5. A mowing machine comprising a frame supported on ground wheels, a member projecting forwardly from the frame, and an upright bearing carried by the front end of said member, an upright shaft rotatable in said upright bearing, a substantially horizontal cutter bar on the lower end portion of the shaft, a hub carried by the upright bearing and adjustable along the same, arms extending from the hub and inclined downwardly, a substantially semi-circular cutter bar guard carried by the arms and located in substantially the same horizontal plane with the cut-

ter bar, ground wheels carried by the guard, a U-shaped fender bar for the cutter bar above the plane thereof and having its ends carried by and endwise adjustable on certain of the arms, and means for driving the shaft.

FOSTER M. FORD.

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GANG MOWER ASSEMBLY FOR UTILITY TRACTORS

Filed Sept. 9, 1958 3 Sheets-Sheet 1

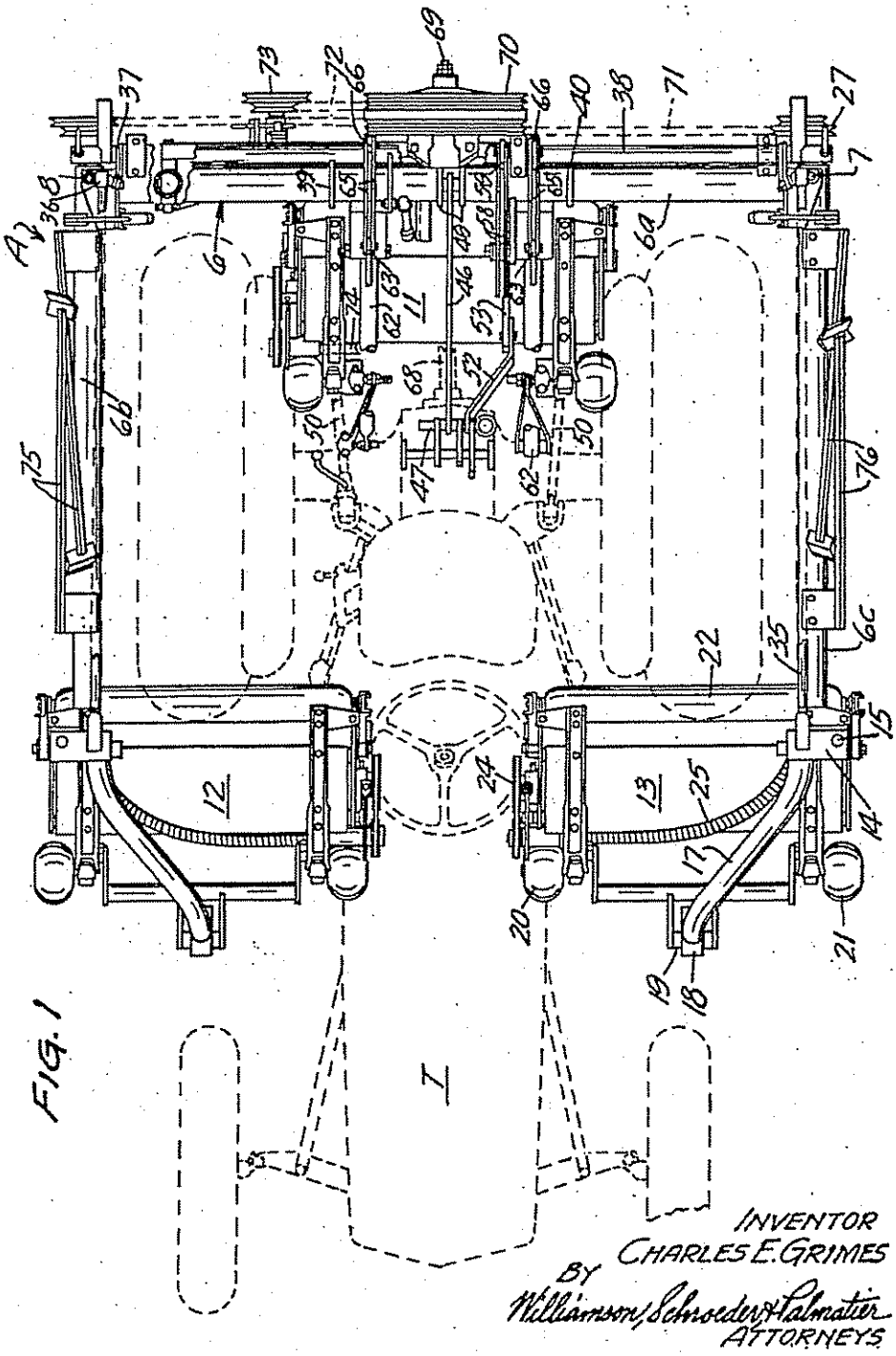

FIG. 1

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GANG MOWER ASSEMBLY FOR UTILITY TRACTORS

Filed Sept. 9, 1958 3 Sheets-Sheet 2

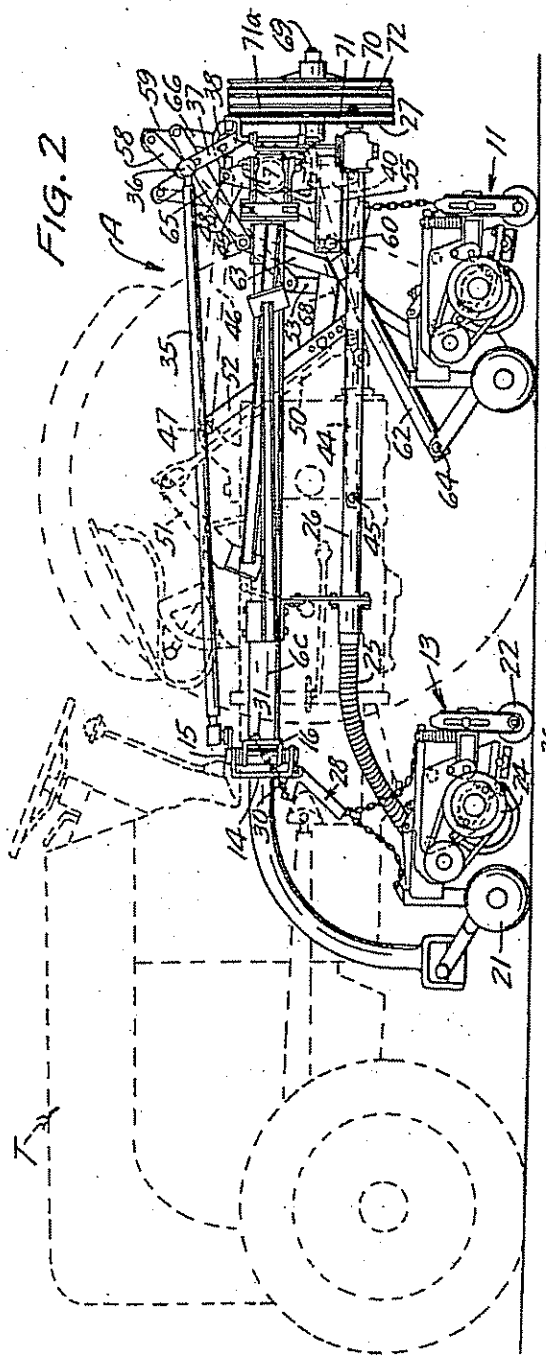

FIG. 2

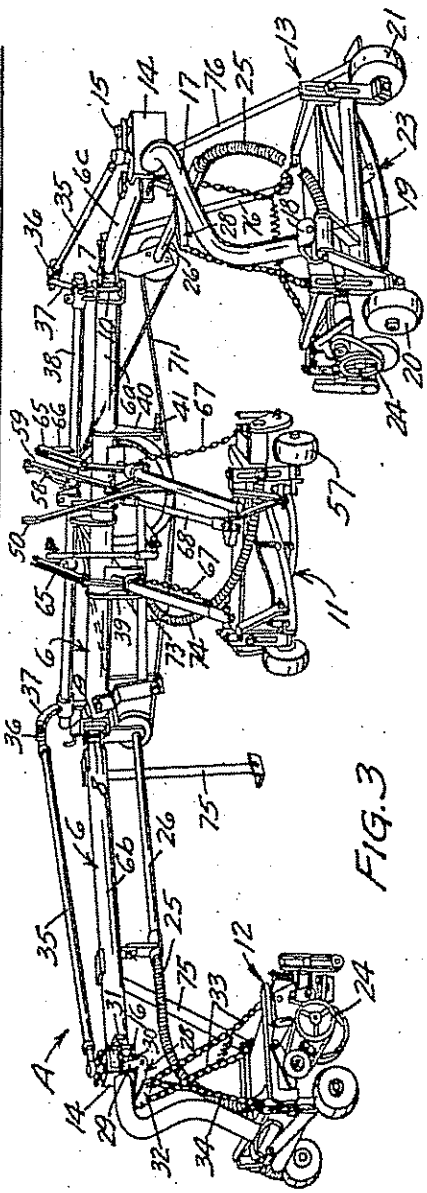

FIG. 3

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GANG MOWER ASSEMBLY FOR UTILITY TRACTORS

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FIG. 4

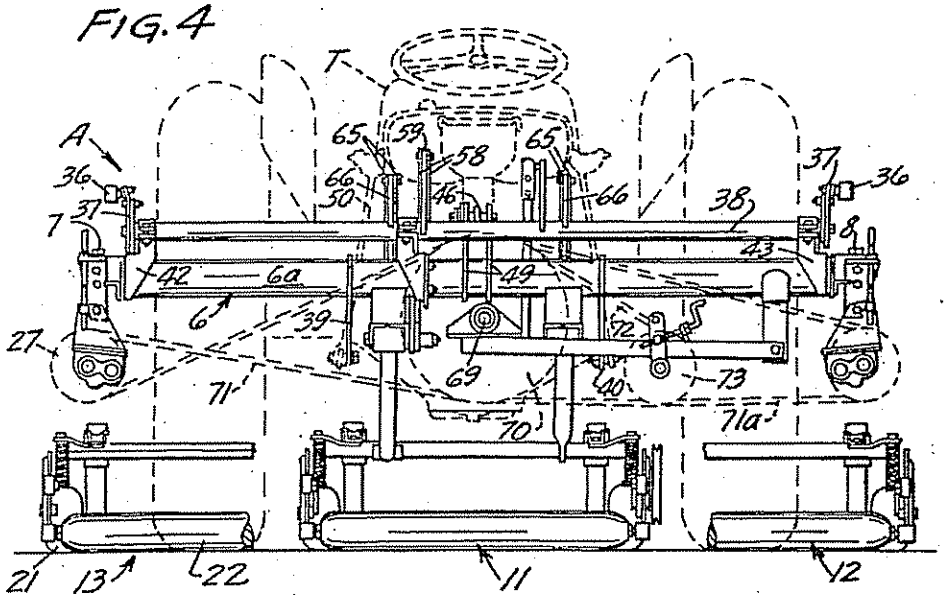
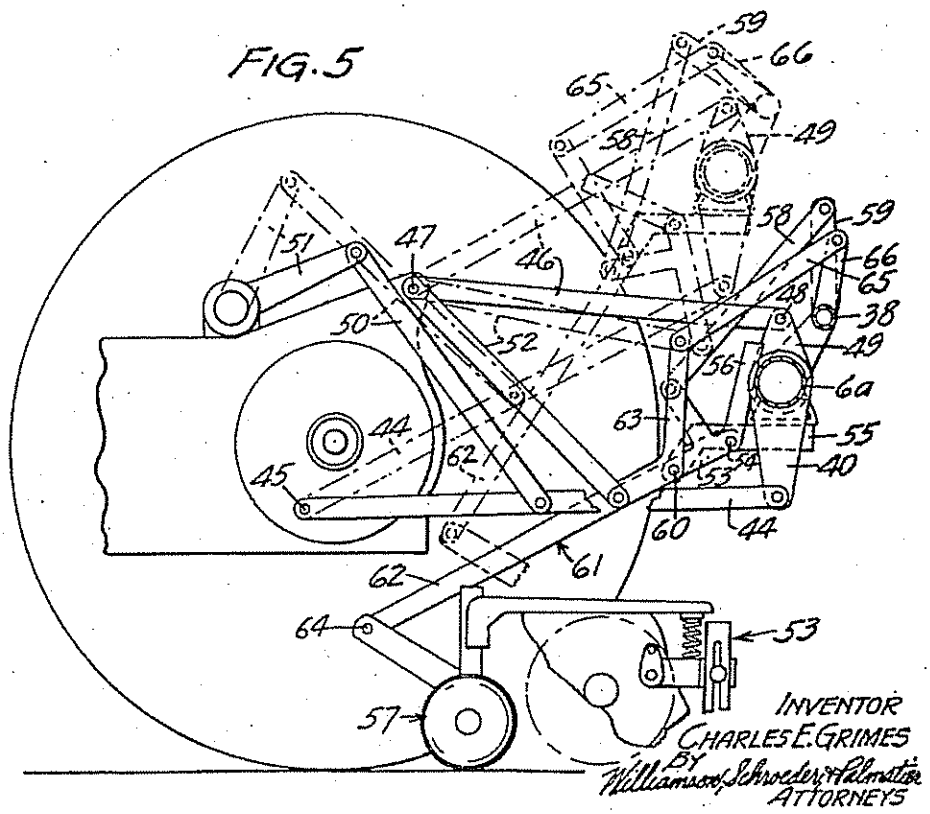


FIG. 5



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United States Patent Office 2,936,561 Patented May 17, 1960

2,936,561

GANG MOWER ASSEMBLY FOR UTILITY TRACTORS

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Application September 9, 1958, Serial No. 759,943

15 Claims. (Cl. 56—7)

This invention relates to gang mower assemblies. More particularly, it relates to gang mower assemblies adapted to be mounted upon a tractor for propelling thereby in order to traverse the ground, the assembly preferably being capable of quick and ready attachment and detachment relative to the tractor and being usable with tractors of the "utility" type which are so constructed as to have low silhouette.

It is a general object of my invention to provide a novel gang mower assembly capable of quick and simple attachment or detachment to a tractor and usable with a tractor having a low silhouette.

A more specific object is to provide a gang mower assembly which may be mounted upon a utility type tractor and may be raised and lowered relative to the frame of the tractor without damage to either the tractor or the mower assembly.

Another object is to provide a novel gang mower assembly capable of being mounted upon a utility type tractor and of being attached to or detached from such a tractor in the most simple and quick manner possible.

Another object is to provide a novel gang mower assembly which will surround the outline of the tractor to which it is attached and which is capable of having the portions thereof which extend along the side of the tractor swing outwardly in order to facilitate detachment from the tractor.

Another object is to provide a novel gang mower assembly capable of being utilized on a low silhouette utility type tractor with its forward moving units disposed directly ahead of the rear wheels of the tractor.

Another object is to provide a gang mower assembly capable of being attached to a tractor in such a manner that each of the mowing units thereon will be driven by the power take off of the tractor, including those disposed ahead of the rear wheels of the tractor.

Another object is to provide a novel gang mower assembly for use in combination with a low silhouette utility type tractor and which is constructed and arranged to have mowing units disposed immediately ahead of the rear wheels of the tractor, these mowing units being so constructed and actuated by the remainder of the assembly as to cause them to shift forwardly and outwardly when elevated so as not to engage the tires of the rear wheels or the running board or other parts of the tractor during such elevation and to shift rearwardly and inwardly when lowered to a position directly in front of the rear wheels of the tractor and within the vertical confines of the rear wheel of the tractor.

Another object is to provide a novel gang mower assembly capable of being connected to a tractor in such a manner that the three point hitch of the tractor and its hydraulic lift constitutes the sole means of attaching the assembly to the tractor and for elevating and lowering the assembly.

These and other objects and advantages of my invention will more fully appear from the following description made in connection with the accompanying drawings,

wherein like reference characters refer to the same or similar parts throughout the several views and in which:

Fig. 1 is a plan view of one embodiment of my invention mounted upon a tractor with the tractor shown in phantom;

Fig. 2 is a side elevational view of the same embodiment with the tractor again shown in phantom by means of broken lines in order to more clearly show the construction of the mower assembly;

Fig. 3 is a perspective view of my gang mower assembly shown detached from the tractor and with its forwardly extending legs spread to facilitate attachment of the tractor to the assembly;

Fig. 4 is a rear elevational view of my invention mounted upon a tractor, the tractor again being shown in phantom by broken lines;

Fig. 5 is a vertical sectional view showing the elevating and shifting linkage in elevation in order to more clearly understand the operation of the assembly.

The purpose of my invention is to provide a readily attachable and detachable mowing assembly utilizing a plurality of separate mowing units and usable with tractors having a low silhouette. Many tractors which are commonly termed "utility tractors" have very low silhouettes and most gang mower constructions as known today are constructed in such a manner that they cannot be utilized in combination with a utility type tractor. Many organizations own such type of tractors and also have need for gang mowers, but because of the low silhouette characteristic of their tractors, they have been unable to utilize the gang mowing assemblies available on the market. Most such gang mowing units for tractors are constructed for use with tractors having a higher silhouette and these mowing assemblies will not work on the low silhouette type tractors (such as the Ferguson type) because there is insufficient clearance provided by the body of the tractor to permit the mower units to operate properly or to be raised and lowered as required. These assemblies must be constructed so that the forward mowing units mow directly ahead of the big rear wheels of the tractor and so that a third and rear unit may trail behind the rear wheels so as to overlap the area between the two front mowing units. The low silhouettes of the utility type tractors prevents the elevation and lowering of the mowing units of the conventional gang mower assembly when they are positioned ahead of the rear wheels of the tractors.

Thus it can be seen that my invention is designed to eliminate the need for two separate tractors in the event the owner desires to have a gang mower assembly and also a utility tractor.

One embodiment of my invention may include as shown in Figs. 1–5 a gang mower assembly indicated generally by the letter A which is removably mounted upon a tractor indicated by the letter T which has a low silhouette. As shown, the assembly A is comprised of a U-shaped frame indicated generally by the numeral 6 and having a base portion 6*a* and a pair of legs 6*b* and 6*c*. The base portion 6*a* when connected to the tractor extends transversely thereof and therebehind and the legs 6*b* and 6*c* of the frame extend forwardly therefrom and along the sides of the tractor as best shown in Figs. 1 and 2. It will be noted that the legs 6*b* and 6*c* are pivotally secured to the base portion 6*a* of the frame 6 at opposite ends of the base portion so as to pivot about a vertical axis defined by pivot pins 7 and 8. These legs 6*b* and 6*c* are thus capable of swinging outwardly relative to the tractor and laterally to the extended positions shown in Fig. 3 after the locking pins 9 and 10 have been removed to permit such swinging movement. When the legs 6*b* and 6*c* are moved to a parallel position to extend along the sides of the tractor as shown in Fig.

1, these pins 9 and 10 are replaced to lock the legs 6b and 6c in such position. It will be noted that the base leg 6a carries a mowing unit indicated generally by the numeral 11 while the leg 6b carries a similar mowing unit indicated by the numeral 12 and the leg 6c carries a similar unit indicated by the numeral 13. These units 11, 12 and 13 are propelled by the frame 6 when the frame is secured to the tractor and are elevated and lowered by the frame 6 when the latter is caused to be raised or lowered by the tractor as hereinafter described. The cutting mechanism of each of these mowing units 11, 12 and 13 is propelled by a drive mechanism which is connected to the power take off of the tractor as will be hereinafter described.

Each of the front mowing units 12 and 13 is mounted upon the forward ends of the respective legs 6b and 6c in identical manner so as to cause the mowing units to swing forwardly and outwardly when the mowing assembly A is elevated and to swing inwardly and rearwardly when the assembly is lowered. For the sake of brevity the mowing unit 13 will be described in detail with the understanding that the mowing unit 12 is of similar structure.

As best shown in Figs. 2 and 3, the mowing unit 13 is pivotally mounted upon the forward end of the leg 6c through the use of a U-shaped mounting bracket 14 and a vertically extending pivot pin 15, the latter of which is carried within a forwardly facing U-shaped bracket 16 at the end of the leg 6c. Through this connection, the entire unit is supported by the frame 6, including the arm 17 which extends forwardly and then inwardly and then forwardly as well as downwardly as best shown in Fig. 3 relative to the bracket 14. Reference to Fig. 3 will show that the bracket 14 is of considerable length when considered transversely of the leg 6c and will show that the pivot pin 15 is adjacent one end thereof while the arm 17 is disposed adjacent the opposite end thereof.

The mounting arm 17 serves to draw the mowing unit 13 across the terrain and is connected to the frame of the mower by a downwardly facing bracket 18 which is pivotally connected to a horizontal pivot 19 which in turn is pivotally connected to the frame of the mowing unit. Thus the frame of the mowing unit is capable of pivot about a horizontal, transverse axis and also about an upwardly inclined axis which extends in a vertical plane parallel to the vertical plane of the leg 6c. A pair of wheels 20 and 21 designed to substantially eliminate scuffing support the front corners of the mowing unit 13 while a roller 22 supports the rear end of the unit. The unit 13 has a reel type cutting mechanism indicated generally by the numeral 23 and this mechanism is driven by means of a pulley and belt arrangement indicated generally by the numeral 24 which in turn is propelled by means of a flexible cable 25 that extends rearwardly through a rigid tube 26 and terminates with a sheave 27 which is mounted upon the leg 6c and swings therewith. The sheave 27 extends in a vertical plane transverse relative to the frame of the tractor when the assembly A is connected thereto in operating position.

Pivotally mounted on the bracket 14 for swinging movement about a horizontal axis extending transversely of the bracket 14 is a bell crank 28. One arm 29 of the bell crank is anchored by a chain 30 to an anchoring lug 31 as best shown in Fig. 3 relative to the mowing assembly 12. A transverse arm 32 is mounted upon the other arm of the bell crank and supports a plurality of chains indicated by the numeral 33. It will be noted that when the bracket 14 pivots outwardly about the pivot pin 15 the mounting arm 17 will necessarily move forwardly and laterally outwardly, carrying with it the bell crank 28. Since the upper end of the arm 29 of the bell crank is anchored, this will cause the bell crank to pivot and elevate the arm 32 causing it to swing upwardly and rearwardly. Such upward and rearward movement causes the chains 33 and 34 which are connected to the mowing

unit to be pulled taut and thereby compel the mowing unit to follow the frame 6 in upward movement as the frame is raised.

Each of the brackets 14 is pivotally connected at its end opposite the end through which the pivot pin 15 extends to a shift rod 35 which extends longitudinally of the leg and rearwardly to a point adjacent the base portion 6a. The shift rod 35 is pivotally connected at its opposite end as at 36 to a torque arm 37 which extends upwardly from a torque tube or shaft 38. The torque arm 37 is fixedly secured to the torque tube 38 so as to rotate therewith when the torque tube is turned about its longitudinal axis. Thus when the torque tube 38 is caused to rotate about its longitudinal axis, the torque arm 37 will force the shift rod 35 to move the bracket 14 forwardly and outwardly or rearwardly and inwardly as the case may be about the pivot pin 15 and simultaneously, carry the mowing unit supported thereby with it in the same directions. For example, when the shift rod 35 moves forwardly, the bracket 14 will pivot about the pivot pin 15 and swing its opposite end forwardly and outwardly, thereby causing the mowing unit to swing forwardly and outwardly relatively to the wheel of the tractor. Likewise, when the shift rod 35 is pulled rearwardly through rotation of the torque tube 38, the free end of the bracket 14 will be drawn inwardly and rearwardly and the mowing unit supported thereby will be likewise moved in the same direction. The inward and rearward movement of the support arm 17 and the bracket 14 will permit the bell crank 28 to turn in such a manner as to release the chains 33 and 34, thereby permitting the mowing unit to be supported by the wheels 20 and 21 and the roller 22.

The base portion 6a of the frame 6 has a pair of depending brackets 39 and 40 fixedly secured thereto and extending downwardly therefrom. Each of these brackets is provided with a laterally extending pivot pin such as 41 which extends outwardly from the lower end of the bracket. At opposite ends of the base portion 6a there is also provided a pair of mounting brackets 42 and 43 which pivotally mount the torque tube 38 as best shown in Fig. 4.

Pivotally mounted upon each of the pivot pins 41 at the lower ends of the brackets 40 is a link such as is indicated by the numeral 44 in Fig. 5 which extends forwardly and is pivotally secured to the frame of the tractor at opposite sides of the frame of the tractor as indicated by the numeral 45. This pair of links 44 constitutes the lower legs of a parallelogram connection between the tractor and the base portion 6a of the frame 6. The upper leg of the parallelogram is comprised of a single link 46 which is pivotally connected to the tractor at 47 immediately behind the seat of the tractor and extends rearwardly from that point and is pivotally secured at 48 to an upstanding bracket 49 which is rigidly secured to the base portion 6a. The forward side of the parallelogram connection is comprised, of course, by the frame of the tractor and the rearward leg is comprised of the bracket 49, the base portion 6a and the brackets 39 and 40. Pivotally secured to the medial portion of the link 44 is a lift arm 50 which has its upper end secured to the hydraulic lift 51 of the tractor. Thus, when the hydraulic lift 51 moves to the broken line position shown in Fig. 5, the parallelogram connection described above will shift to the broken line position shown in Fig. 5 and will lift the base portion 6a and the remainder of the frame 6 therewith. Hence, it can be seen that I have utilized the three point hitch of the tractor as the sole supporting means for the entire frame and the mowing units secured thereto and have taken advantage thereby of its inherent features of quick attachment and detachment.

Rotation of the torque tube 38 and the consequent shifting of the shift rod 35 and the outward and forward swinging of the mowing units disposed ahead of the rear

wheels of the tractor is accomplished by means of a linkage mechanism extending between the torque arm and the tractor. The point of connection at the forward end of this linkage is the same as that at which the upper leg 46 of the parallelogram is secured to the tractor, indicated by the numeral 47. This mechanism is comprised of a rigid link 52 pivotally secured at its upper end at the point 47 to the tractor and pivotally secured at its lower end to a bell crank 53 which, as shown in Fig. 5, is right angled and is pivoted at 54 upon a pivot block 55 which is welded to the base portion 6*a* at its under side. Rigidly secured to the bell crank 53 at its point of pivot is an abutment member 56 which bears against the base portion 6*a* to prevent the frame 6 from dropping any lower than the position shown in Fig. 5 when the machine is lowered to operating position. As shown, one arm of the bell crank is pivotally secured to the link 52 and the other arm is pivotally secured at its upper end to a rigid link 58 which in turn is pivotally secured at its upper end to a torque arm 59. As best shown in Fig. 5, this torque arm 59 extends upwardly from the torque tube 38 and is fixedly secured thereto and rotates therewith. When the parallelogram connection moves to the broken line position shown in Fig. 5, this linkage mechanism shifts to the broken line position also shown in that figure. Careful examination of the positions of the respective links shows that the bell crank 53 swings in a counterclockwise direction about its pivot mounting 54, thereby causing the link 58 and the torque arm 59 to be drawn forwardly, the necessary result of which is to cause the torque tube 38 to rotate in a counterclockwise direction as viewed in Fig. 5. It is this linkage which gives the necessary rotation to the torque tube 38 to cause the shift rods 35 to shift forwardly as the frame is lifted by the lift arm 50 and to cause rotation in the opposite direction and consequent rearward shifting of the shift rods 35 when the frame is lowered.

Pivotally mounted on the pivot block 55 at the point 60 is a bell crank indicated generally by the numeral 61 and having arms 62 and 63 the former of which is pivotally connected at 64 to support the forward end of the mowing unit 11 as is shown in Fig. 5. The upper end of the arm 63 is pivotally connected to a rigid link 65 and this link has its upper end pivotally connected to a torque arm 66 which is also fixedly secured to the torque tube 38 for rotation therewith. This linkage will shift to the broken line position shown in Fig. 5 when the frame 6 is lifted, thereby causing the mowing unit 57 to be raised upwardly through the action of the bell crank 61 and the chains indicated by the numeral 67. It should be understood that there is a second pivot block similar to the pivot block 55 and a similar link mechanism as that comprised of the bell crank 61, link 65 and torque arm 66 at the other side of the mowing unit 57 as can be clearly seen in Fig. 3. Thus there is a bell crank arrangement at each side of the mowing unit 57 which cooperatively raises this mowing unit along with the frame 6 as it is elevated by the lift arm of the tractor and the parallelogram connection to the three point hitch of the tractor.

Drive shaft 68 is connected for universal movement at its forward end to the power take-off of the tractor. At the opposite end of the drive shaft 68 it is connected for universal movement with the shaft 69 of a drive wheel 70 which is rotatably mounted upon the base portion 6*a* of the frame. This drive wheel 70 is of the multiple belt type and carries belts 71, 71*a* arranged as best shown in Fig. 4 to simultaneously drive the sheave 27 and the corresponding sheave carried at the rear end of the leg 6*b* as best shown in Fig. 3. In this manner, each of the cutting mechanisms of the two mowing units 12 and 13 are driven by the drive wheel 70. A third belt 72 extends around the drive wheel 70 and in driving relation to a third sheave 73 which is connected by a flexible cable 74 to the cutting mechanism of the rear mowing unit 11.

In this manner, each of the mowing units is driven by the power take-off of the tractor through a drive shaft 68 and the entire mechanism required therefrom moves upwardly and downwardly with the frame 6 and the mowing units supported thereby.

A pair of supports 75 and 76 having flat bases are pivotally secured to the legs 6*b* and 6*c* of the frame 6 respectively. When these legs 75 and 76 are swung to depending position, they will support the entire frame 6 upon the ground while the unit is not being utilized.

When the mowing assembly is not being utilized it is parked in the position shown in Fig. 3. To secure the unit to the tractor, the tractor may be easily backed in position for connection of the links 44 to the pivot pins 41 of the brackets 39 and 40. The link 46 may be also secured at the point 47 on the tractor to complete the parallelogram hitch. The lift arm 50 is also connected to the hydraulic lift 51 and the drive shaft 68 is connected to the power take-off of the tractor. It will be noted that the legs 6*b* and 6*c* when in stored position as shown in Fig. 3 are swung laterally and in order to complete the connection they must be swung inwardly to a position where they extend parallel to the tractor. To do this, the frame 6 may be lifted by the hydraulic lift and the legs 6*b* and 6*c* may then be easily swung inwardly to a position where the mowing units 12 and 13 are positioned directly in front of the wheels of the tractor as shown in Fig. 1. The locking pins 9 and 10 may then be inserted to hold the legs 6*b* and 6*c* in this position. The unit is then ready for operation as hereinbefore described wherein the frame 6 may be lowered by operation of the hydraulic lift 51 of the tractor. Attendant with the lowering of the frame 6, the torque arm 38 will rotate in a clockwise direction as viewed in Fig. 5, thereby causing the shift rods 35 to shift rearwardly and swing the mowing units 12 and 13 inwardly and rearwardly to a position directly in front of the wheels of the tractor and slightly therebelow as best shown in Fig. 2. Whenever it is desired to elevate the mowing units 12, 13 and 57, the hydraulic lift may be operated whereupon the linkage attached to the torque arm 38 will cause the latter to rotate in a counterclockwise direction as viewed in Fig. 5 and thereby cause the shift rods 35 to shift forwardly and swing the mowing units 12 and 13 forwardly and outwardly relative to the tractor, thereby avoiding engaging the frame of the low silhouette type tractor.

Detachment of this unit from the tractor is a simple matter, for the pins 9 and 10 may be removed and the legs 6*b* and 6*c* swung outwardly while the unit is in elevated position. The legs 75 and 76 may then be swung to depending position and will support the weight of the frame when it is lowered. The drive shaft 68, the hydraulic lift 51 and the three point hitch of the tractor may then be disconnected whereupon the tractor may be driven away. From this it can be seen that the mounting of this unit is extremely simple in that it does not involve or require disassembly of any part of the unit in order to attach or detach the same relative to the tractor.

It will be noted that the link 52 which extends downwardly and rearwardly from the tractor is the actuating link which acts to operate a system of mechanical linkage attached to the frame which accomplishes a number of functions when the frame is elevated by the hydraulic lift 51. This mechanical linkage causes the cutting units to be moved into positions where they will clear the tractor when the machine is lifted to transport position. It also moves the cutting units into operating position when the machine as a whole is lowered into operating position by operation of the tractor's hydraulic system. In addition, it provides a measure of restraint on the forward cutting units so that they will not sway unduly during transport and so that the main frame can perform the function of lifting them from operating position to transport position. This is accomplished by the action of the bell crank 52 and the chains 33 and 34, for

this system tends to prevent the forward cutting units from swaying unduly while being transported in elevated position.

It will be noted that the forward cutting units of my assembly are connected to draw bars in such a way that neither of the forward cutting units can have any appreciable motion relative to the tractor about a vertical axis. This allows the cutting units to be placed much closer to the tractor than would otherwise be possible while in cutting position. The only appreciable motion about a vertical axis of the forward cutting unit takes place when the cutting units are being moved to and from a non-operating position. Once they have been moved to cutting position, there is very little movement about a vertical axis which can take place with the draw bars consisting of the mounting arm 17 and the bracket 18 and 19.

It will also be noted that the unique connection between my gang mower assembly and the tractor is such as to control the movement of the forward mowers while cutting and to support them during transport entirely from the hitch arms on the rear of the tractor through the rear portion of my frame and its cantilever side booms as represented by the legs 6*b* and 6*c*.

From the above it can be seen that I have provided a unique and highly improved gang mower assembly which may be easily and quickly attached and detached to the frame of a tractor by merely utilizing the three point hitch thereof. In addition, it will be noted that I have provided a unique gang mower assembly capable of being utilized in combination with a low silhouette type tractor commonly referred to as a utility tractor. Through the use of my assembly, any organization owning a utility type tractor may now utilize the same tractor for operating a gang mower assembly and can thereby avoid the expense of purchasing a tractor of the higher silhouette type in addition to the one which it already owns.

It will, of course, be understood that various changes may be made in the form, details, arrangement and proportions of the various parts without departing from the scope of my invention.

What is claimed is:

1. A mowing assembly for use on a tractor comprising, a generally U-shaped frame constructed and arranged to be connected to a tractor having rear wheels, said frame having a base portion extending transversely of and behind the tractor and two leg portions one each of which extends forwardly from said base portion along opposite sides of the tractor when so connected to the tractor, said leg portions being swingably connected to said base portion to permit said leg portions to swing laterally outwardly from the tractor about an upright axis disposed rearwardly of the axis of rotation of the rear wheels of the tractor when said frame is so connected thereto to facilitate connection and disconnection of the frame with the tractor, and a pair of mowing units one each of which is connected with one of said leg portions, and is disposed ahead of a rear wheel of the tractor when said frame is connected thereto and is swingable laterally outwardly with its respective leg portion from a position ahead of its associated rear wheel of the tractor to facilitate disconnection of said frame from the tractor.

2. A mowing apparatus comprising, a tractor having front and rear wheels, a generally U-shaped frame removably mounted on said tractor and having a base portion extending transversely thereof and therebehind and two leg portions one each of which extends forwardly from said base portion along opposite sides of said tractor, and a pair of mowing units one each of which is connected with one of said leg portions and is disposed adjacent a rear wheel of said tractor, said mowing units being disposed in front of said rear wheels and a substantial distance behind the front wheels of said tractor and being swingable in opposite directions laterally outwardly relative to said tractor about an upright axis disposed rearwardly of the forwardmost portions of the rear wheels of said tractor to facilitate the removal of said frame from said tractor.

3. A mowing assembly for use on a tractor comprising, a generally U-shaped frame constructed and arranged to be connected to a tractor having rear wheels and a hydraulic lift thereon, said frame having a base portion extending transversely of and behind the tractor and two legs one each of which extends forwardly from said base portion along opposite sides of the tractor when so connected to the tractor, said legs having mowing unit carrying portions swingable laterally outwardly from the tractor about a vertical axis disposed rearwardly of the rear wheels of the tractor when said frame is so connected thereto to facilitate connection and disconnection of the frame with the tractor, and a pair of mowing units one each of which is connected with one of said swingable leg portions and is entirely disposed ahead of a rear wheel of the tractor when said frame is so connected and is swingable laterally outwardly with its respective leg portion from a position ahead of its associated rear wheel of the tractor to facilitate disconnection of said frame from the tractor.

4. The structure defined in claim 3, and a third mowing unit connected to said base portion and normally overlapping the path of cut of said pair of mowing units when said frame is so connected.

5. The structure defined in claim 3, and power transmitting mechanism carried by said frame and connected with each of said mowing units and constructed and arranged to be connected in driven relation to a power take-off of such a tractor.

6. The structure defined in claim 3, and means for connecting said frame to the hydraulic lift of such a tractor in solely supported relation whereby said frame and said mowing units may be elevated or lowered into contact with the ground by the hydraulic lift as desired.

7. A mowing apparatus comprising, a generally U-shaped frame constructed and arranged to be connected to a tractor having rear wheels and a hydraulic lift thereon, said frame having a base portion extending transversely of and behind the tractor and having two legs, one each of which extends forwardly from said base portion along opposite sides of the tractor when so connected to the tractor, said legs having mowing unit carrying portions swingable laterally outwardly from the tractor about an axis disposed rearwardly of the forwardmost portions of the rear wheels of the tractor when said frame is so connected thereto to facilitate connection and disconnection of the frame with the tractor, a pair of mowing units, one each of which is connected with one of said swingable leg portions and is swingable laterally outwardly therewith, and power transmitting mechanism carried by said frame and connected with each of said mowing units in power transmitting relation, such mechanism being constructed and arranged to be connected in driven relation to a powered take-off of such a tractor.

8. A mowing apparatus comprising a tractor having rear wheels and a hydraulic lift thereon, a generally U-shaped frame mounted on said tractor and having a base portion extending transversely thereof and therebehind and two legs one each of which extends forwardly from said base portions along opposite sides of said tractor, the lift of said tractor being detachably connected to said frame in solely supporting relation to elevate and lower the same as desired, each of said legs having mowing units carrying portions swingable laterally outwardly from the tractor about an axis disposed rearwardly of the axis of rotation of the wheels of said tractor to facilitate connection and disconnection of the frame with the tractor, a pair of mowing units one each of which is

movably mounted on the mowing unit carrying portion of each of said legs and is movable longitudinally of said leg, said mowing units being disposed in front of said rear wheels of said tractor and being swingable in opposite directions laterally outwardly relative to said tractor to facilitate removal of said frame from said tractor, and shifting mechanism mounted on said frame and connecting said mowing units to the hydraulic lift of said tractor, said shifting mechanism being arranged in controlled relation with the hydraulic lift of said tractor to cause said mowing units to shift longitudinally of said leg portions as said hydraulic lift elevates and lowers said frame.

9. A mowing apparatus comprising, a tractor having rear wheels and a three point hitch, a generally U-shaped frame removably connected to said tractor by said three point hitch and supported solely thereby and having a base portion extending transversely thereof and behind said tractor and two leg portions one each of which extends forwardly from said base portion along opposite sides of said tractor, and a pair of mowing units one of which is connected with one of said leg portions and is disposed ahead of a rear wheel of said tractor, said mowing units being swingable in opposite directions laterally outwardly relative to said tractor to facilitate the removal of said frame from said tractor, the sole supporting means for said frame and said mowing units by said tractor being the three point hitch of said tractor whereby said frame and said mowing units may be lowered and raised at will by the operator of the tractor.

10. A mowing apparatus comprising, a tractor having rear wheels, a generally U-shaped frame removably mounted on said tractor and having a base portion extending transversely thereof and therebehind and two legs one each of which extends forwardly from said base portion along opposite sides of said tractor, said legs having mowing unit carrying portions swingable laterally outwardly from the tractor about an axis disposed rearwardly of the axis of rotation of the rear wheels of said tractor to facilitate connection and disconnection of said frame with the tractor, said leg portion normally extending parallel to the longitudinal axis of said tractor, and a pair of mowing units one each of which is connected to one of said leg portions and is disposed ahead of one of the rear wheels of said tractor and extending into the vertical confines of the outline thereof and being swingable with said leg portion in opposite directions laterally outwardly relative to said tractor to facilitate the removal of said frame from said tractor.

11. A mowing apparatus comprising, a tractor having rear wheels and a hydraulic lift, a generally U-shaped frame removably mounted on said tractor and connected in solely supported relation with the lift thereof for elevation and lowering thereby and having a base portion extending transversely thereof and therebehind and having two leg portions one each of which extends forwardly from said base portion along opposite sides of said tractor, and a pair of mowing units one each of which is connected with one of said leg portions and is disposed ahead of one rear wheel of said tractor and extends into the vertical confines of the outlines of said tractor, each of said mowing units being supported by said frame in elevated position when said frame is elevated by the hydraulic lift of said tractor and being swingable in opposite directions laterally outwardly relative to said tractor about an axis disposed at one end of said transverse portion to facilitate the removal of said frame from said tractor.

12. A mowing assembly for use on a tractor having a power take-offcomprising, a generally U-shaped frame constructed and arranged to be mounted on a tractor, said frame having a base portion extending transversely of and behind the tractor and two leg portions one each of which extends forwardly from said base portion along opposite sides of the tractor when said frame is so mounted on the tractor, a pair of mowing units one each of which is supported and propelled by one of said leg portions and is disposed ahead of a rear wheel of the tractor when said frame is mounted thereon, and rotary drive mechanism carried by said base portion of said frame and extending forwardly and being connected in driving relation to each of said mowing units, said drive mechanism being constructed and arranged for connection to the power take-off of such a tractor in driven relation thereto to transmit driving power to each of said mowing units.

13. A mowing apparatus comprising, a generally U-shaped frame constructed and arranged to be mounted on a tractor having rear wheels and a hydraulic lift thereon, said frame having a base portion extending transversely of and behind the tractor and having two legs one each of which extends forwardly from said base portion along opposite sides of the tractor when so mounted on the tractor, said base portion being adapted to be connected to the hydraulic lift of such a tractor in supported relation for raising and lowering thereof by the hitch, said legs having mowing unit carrying portions swingable laterally outwardly from the tractor to facilitate connection and disconnection of said frame with the tractor, a pair of mowing units one each of which is connected with one of said swingable leg portions and is swingable laterally outwardly therewith, and shift mechanism connected with each of said mowing units and constructed and arranged to be connected to the hydraulic lift of such a tractor in actuate derelation, said mechanism being so constructde and arranged as to cause said mowing units to shift forwardly when said frame is lifted by the hydraulic lift of the tractor and to cause said units to shift rearwardly when said frame is lowered by the hydraulic lift of such a tractor.

14. A mowing apparatus comprising a tractor having front and rear wheels and a hydraulic lift thereon, a generally U-shaped frame removably mounted on said tractor and having a base portion extending transversely thereof and therebehind and two legs one each of which extends forwardly from said base portion along opposite sides of said tractor, three overlapping mowing units, said frame being connected to said mowing units in supporting relation, mechanism connecting said base portion to the three point hitch of said tractor in supported relation for raising and lowering of said frame and said mowing units thereby, and shifting mechanism carried by said frame and connected to the three point hitch of said tractor in actuated relation and being connected to each of said mowing units in actuating relation, said mechanism being constructed and arranged to cause said mowing units to shift away from said tractor when said frame is elevated by the three point hitch of said tractor so that no part of said mowing units or said supporting frame interferes with any part of said tractor and to shift towards said tractor when said frame is lowered by the three point hitch of said tractor.

15. A mowing apparatus comprising, a generally U-shaped frame constructed and arranged to be mounted on a tractor having rear wheels and a hydraulic lift thereon, said frame having a base portion extending transversely of and behind the tractor and having two legs, one each of which extends forwardly from said base portions along opposite sides of the tractor when so mounted on the tractor, said base portion being adapted to be connected to the hydraulic lift of such a tractor in supported relation for raising and lowering thereof by the hitch, said legs having mowing unit carrying portions swingable laterally outwardly from the tractor to facilitate connection and disconnection of said frame with the tractor, a pair of mowing units one each of which is connected with one of said swingable leg portions and is swingable laterally outwardly therefrom, and shift mechanism connected with each of said mowing units and constructed and arranged to be connected to the hydraulic lift of such a tractor in

actuated relation, said mechanism being so constructed and arranged as to cause said mowing units to shift outwardly when said frame is lifted by the hydraulic lift of the tractor and to cause said units to shift inwardly when said frame is lowered by the hydraulic lift of such a tractor.

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GRASS MOWERS

Filed June 20, 1960 3 Sheets-Sheet 1

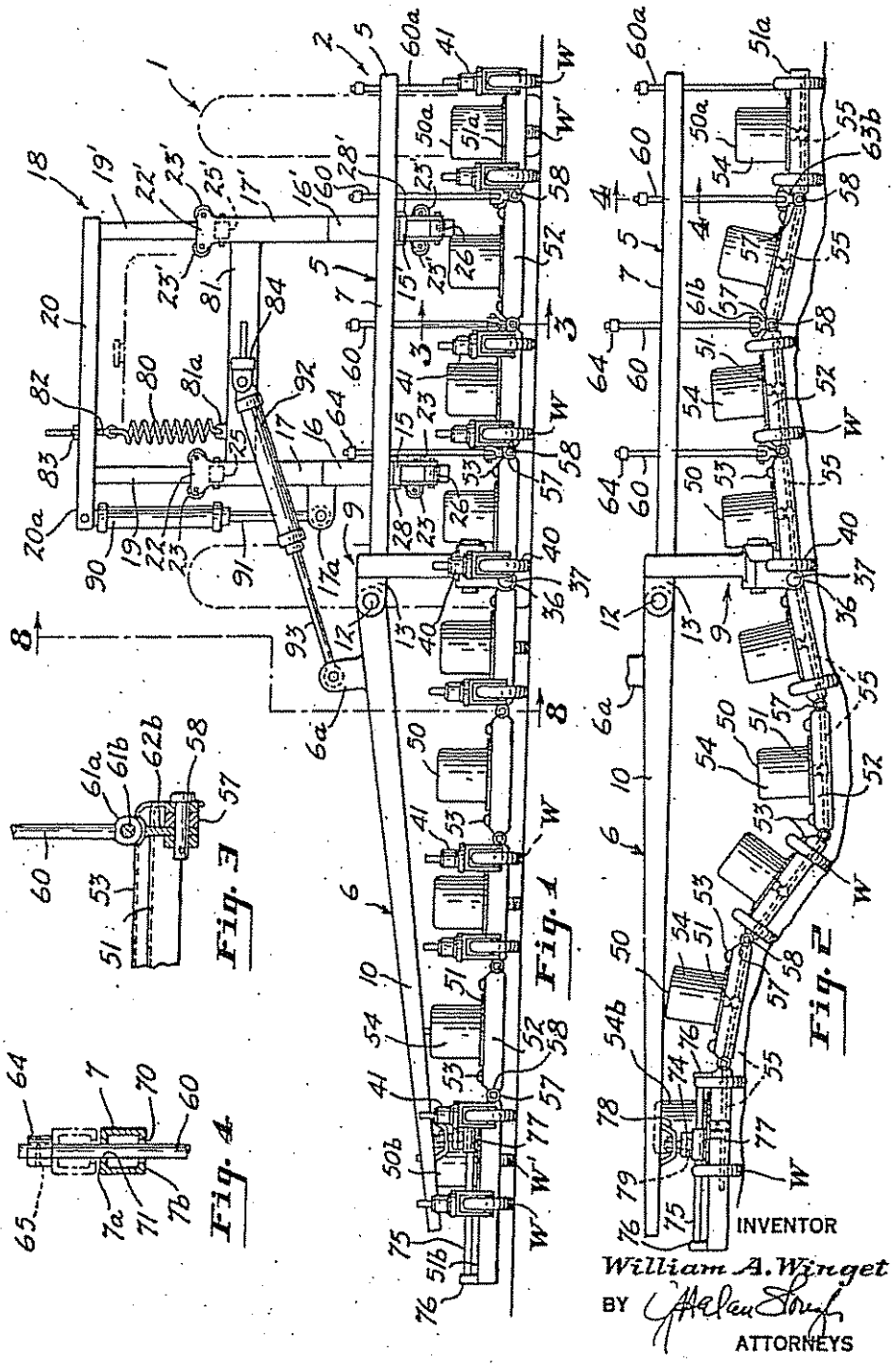

Fig. 3

Fig. 4

Fig. 1

Fig. 2

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GRASS MOWERS

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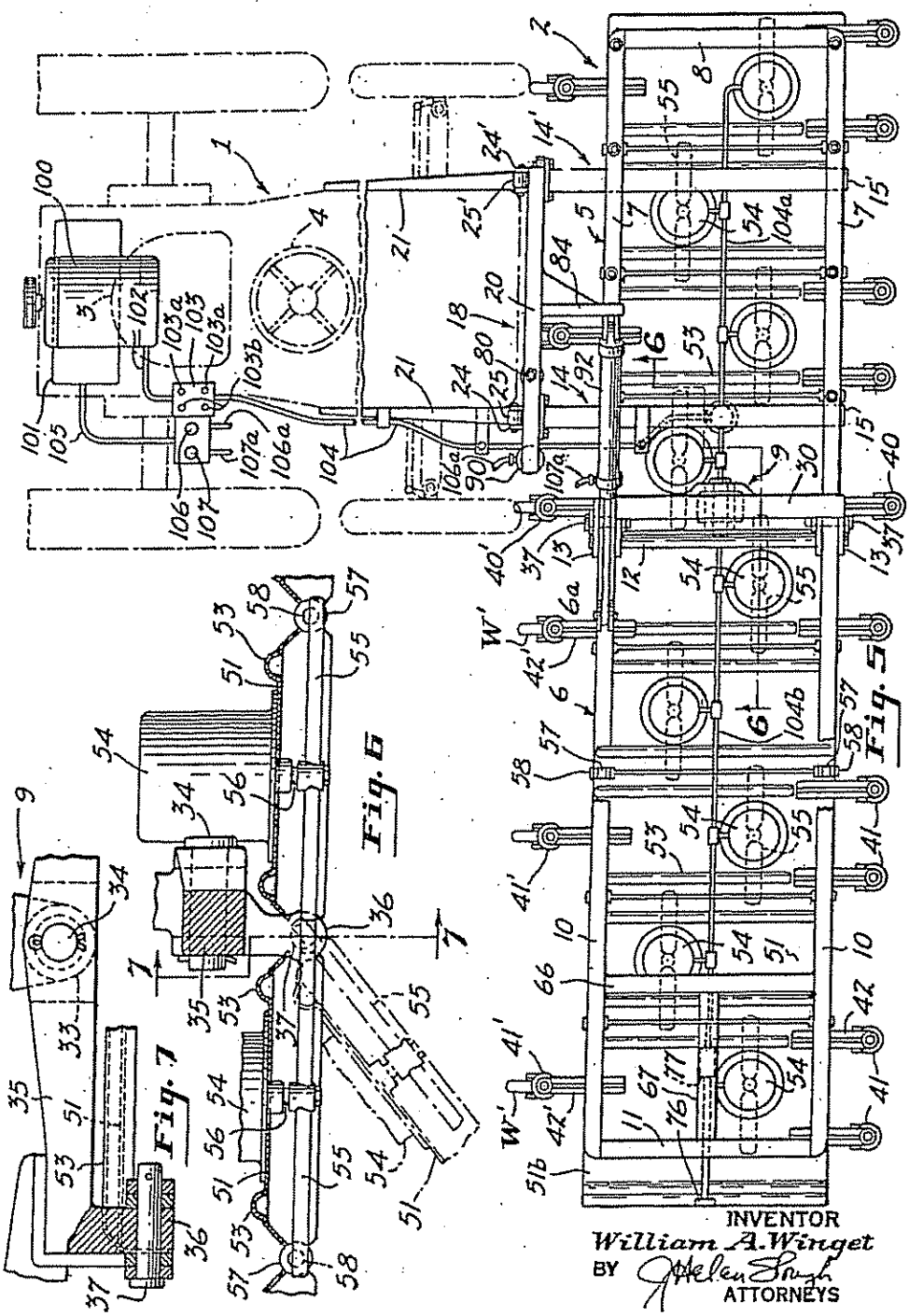

Fig. 5

Fig. 6

Fig. 7

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GRASS MOWERS

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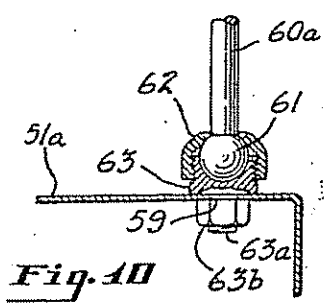

Fig. 10

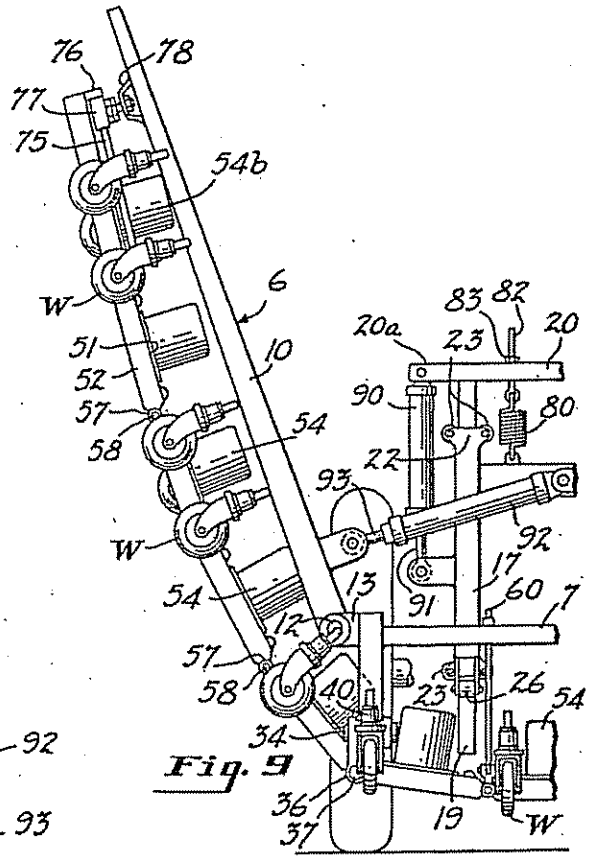

Fig. 9

Fig. 8

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3,070,938

GRASS MOWERS

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This invention relates generally to grass mowers and relates more particularly to improvements in such mowers which comprise a plurality of interconnected individual mowers adapted to operate as a unit and to closely follow both the lateral and longitudinal irregularities of the ground surface over which it is traveling.

It is an object of this invention to provide a device of the above type suitable for attachment to the front or rear end of a tractor or other vehicular source of power.

Another object of this invention is to provide a device of the above type which may be adjusted to cut optionally either a relatively wide or a relatively narrow swath in the grass to be mowed.

Yet another object of this invention is to provide a mower having the above characteristics including means for elevating and deactivating a portion of the individual mower units while using the remaining mower units for grass cutting operations.

A further object of this invention is to provide such a device which includes means for elevating and deactivating all of the individual units when the tractor is to be driven along a highway or road.

Yet another object of this invention is to provide a mower of the above type which readily adapts for grass cutting operations in deep, road-side ditches and on steep banks.

A still further object of this invention is to provide an improved mower of the type referred to wherein the individual mower units have vertical flexibility relative to a single line of supporting contact of the mower with the ground and with respect to each other.

Yet another object of this invention is to provide a mower of the above type wherein each individual mower unit is laterally tiltable relative to the other individual mower units.

Further objects of this invention and the invention itself will be readily apparent from the following description and the accompanying drawings, in which said drawings:

FIG. 1 is a front elevation of the mower showing the tractor in broken lines;

FIG. 2 is a diagrammatic front elevation of the mower frames and associated individual mower units in a relatively different position from that of FIG. 1;

FIG. 3 is a an enlarged sectional view taken along the line 3—3 of FIG. 1;

FIG. 4 is an enlarged sectional view taken along the line 4—4 of FIG. 2;

FIG. 5 is a top plan view of the mower showing the tractor in broken lines;

FIG. 6 is an enlarged sectional view taken along the line 6—6 of FIG. 5;

FIG. 7 is a detail in partial section taken generally along the line 7—7 of FIG. 6;

FIG. 8 is a sectional view taken generally along the line 8—8 of FIG. 1;

FIG. 9 is a partial front elevation of the mower showing all individual mower units in a raised position; and

FIG. 10 is a view similar to FIG. 3 showing the lift rod mounted in a slightly modified way.

The modification of my invention as herein illustrated and described shows a mower adapted to be attached to the forward end of a tractor or the like vehicle whereby two gangs of laterally interhinged mower units

disposed in line with each other and preferably at right angles to the direction of movement of said tractor are propelled across the ground area to be mowed.

The front of the tractor is equipped with a pair of lift forks adapted for vertical movement, and a rectangular frame is secured flatwise across said forks for vertical movement therewith. A second rectangular frame is hingedly connected adjacent one end of the first mentioned frame and projects laterally outwardly to one side of the tractor. Adjacent the hinge there is provided a support, the upper part of which is secured to said first frame and the lower part of which is pivoted to said upper part for pivoting forwardly and rearwardly.

Two gangs of mowers are suspended, one beneath each of the said rectangular frames. One end of each mower gang is hinged to the lower part of the support, each gang projecting laterally therefrom beneath its respective frame. Means are provided for suspending said mowers from their respective frames at points spaced from said support, said means allowing relatively free vertical movement of the individual mower units with respect to their associated frames. Power means is provided for raising said forks and first mentioned frame, and separate power means is provided for pivoting or folding said second mentioned frame upwardly and toward the first frame. Rolling engagement with the ground is provided at the support and at certain of the individual mowers by means of leading and trailing casters.

Each mower unit comprises an individual electric power unit and a blade mounted to a separate frame, and each gang of mowers is supplied with current through a separate circuit. The entire mower may be operated in either a forward or rearward direction by the tractor, and the gang associated with the pivoted frame may be raised whereby that gang only which is associated with the first frame is used in the mowing operation. When it is desired to travel along a road or highway, both said frames and both gangs of mowers suspended therefrom may be raised, the first mentioned frame being raised vertically and the second mentioned frame pivoted or folded up and toward said first frame.

Referring now to the drawings, in all of which like parts are designated by like reference characters, and particularly to FIGS. 1, 2, and 5, at 1 there is indicated in broken lines a tractor adapted to support a gang-type mower generally indicated by the reference numeral 2. The tractor 1, as herein illustrated, is preferably of a conventional four wheel type providing a seat 3 for the operator immediately behind a steering wheel 4. It will be understood that the mower 2 is adaptable for use with any suitable land-type vehicle, and the tractor as herein shown is given as an example only.

The mower 2 comprises a main frame generally indicated at 5, secured immediately in front of the tractor 1 and at right angles to said tractor and a pivoted frame, generally indicated at 6, pivotally mounted to one of the laterally disposed ends of said main frame. As best seen in FIG. 5, the main frame 5 is generally rectangular in shape with its longest dimension directed at right angles to the longitudinal center line of the tractor. Said main frame comprises a pair of parallel, spaced beams 7 joined at one end thereof by a relatively shorter beam 8. The opposite ends of the beams 7 are unitarily joined by means of a universal-type main support 9, hereinafter to be more fully described.

The pivoted frame 6 is also rectangular in shape and is, in the form shown, somewhat longer than the main frame 5. Said pivoted frame comprises a pair of parallel spaced beams 10 joined at their outwardly directed ends by means of a relatively shorter beam 11. The inwardly directed ends of the beams 10 are each secured to a pivot shaft 12 which is pivotally mounted on the main

support 9 by means of laterally projecting support members 13.

The main frame 5 is mounted on the front of the tractor in a horizontally fixed position whereby it remains level with the said tractor at all times. Said main frame is, however, vertically movable relative to the tractor by means of a pair of lift forks 14 and 14'. The lift forks 14—14' are parallel and laterally interspaced and project substantially horizontally in a forward direction from the tractor. Said forks are L-shaped and comprise relatively long, horizontally disposed legs 15—15' and upwardly directed, relatively shorter legs 16—16'. The shorter legs 16—16' are welded or otherwise suitably secured to a pair of vertically movable supports 17—17' which are vertically slidable relative to a fork support frame generally indicated at 18.

The fork support frame 18 as best seen in FIGS. 1, 8 and 9, is generally in the shape of an inverted U comprising a pair of substantially vertically upright guides 19—19' integrally joined at their uppermost ends by a cross beam 20. The guides 19—19' are rigidly and fixedly secured to the frame of the tractor by means of rearwardly directed brackets 21—21' which are disposed laterally on either side of the tractor. The brackets 21—21' are preferably welded to the guides 19—19' and are bolted, welded, or otherwise suitably secured to the frame of the tractor. The movable supports 17—17' are generally U-shaped in horizontal section and adapted to nestingly and slidably fit over the fixed guides 19—19'.

The movable supports 17 and 17' are provided at the extreme upper and lowermost ends thereof with generally triangularly shaped, laterally projecting roller mounts 22—22' which provide mounting means for pairs of rollers 23—23 and 23'—23'. Each pair of rollers 23—23 is so disposed that one of said rollers contacts one side of the guide 19 and the other said roller contacts the other side of said guide. The pairs of rollers 23'—23' are similarly disposed with one roller of each pair being in rolling engagement with one side of the guides 19' and the other roller of each pair being in rolling contact with the other side of said guide 19'.

By referring particularly to FIGS. 1 and 9, it will be readily seen that the rollers 23—23 and 23'—23' provide relatively frictionless engagement from a lateral direction between the movable supports 17—17' and the fixed guides 19—19' and that said rollers effectively prevent binding of the movable to the fixed members which might result from a shifting of the main frame 5 which is supported by the legs 15—15' of the forks 14—14'.

Referring now specifically to FIG. 8, it will be noted that the weight of the main frame 5 upon the lift forks 14—14' will cause the upper ends of the movable support 17—17' to tend to pivot away from the guides 19—19' in a forward direction and that the lowermost ends of said movable support will tend to pivot inwardly toward said guides. To maintain the movable support 17—17' in nesting engagement with the guides 19—19' and to provide a smooth, relatively frictionless contact between the two members, the uppermost ends of said movable supports are provided with pairs of rearwardly projecting ears 24—24 and 24'—24' which project rearwardly beyond the guides 19—19' and provide journal means for axially laterally disposed rollers 25—25'. Said rollers 25—25' contact the rearwardly disposed surfaces respectively of the guides 19—19' whereby the upper ends of the movable supports 17—17' are prevented from pivoting away from said guides.

Similarly, rollers 26—26' are provided adjacent the lowermost ends of the movable supports 17—17', said rollers 26—26' being journaled between pairs of arms 27—27' which are integral with and project downwardly from the lower surface of the lift forks 14—14' respectively. The rollers 26—26' are in rolling engagement with the forwardly directed surfaces of the guides 19—19', and in cooperation with the upper rollers 25—25' effectively prevent binding in a forward and rearward direction between the movable supports 17—17' and said guides.

Adjacent the lower ends of said movable supports there are provided rearwardly projecting, angled retainers 28—28' which are adapted to hook loosely over the rearwardly directed surfaces of the upright guides 19—19'. The purpose of these retainers is to prevent the lower ends of the movable supports 17—17' from moving outwardly from the guides 19—19' in the event that a sudden upward thrust is effected against the lift forks 14—14'. However, it will be understood that the retainers 28—28' under ordinary circumstances do not engage the guides 19—19' and that there is ordinarily no need for such engagement.

The ground engaging weight of the frames 5 and 6 is carried primarily through the universal-type main support 9. Referring now to FIG. 8, the main support 9 comprises a cross member 30 to which the ends of the beams 7 of the main frame 5 are secured on one side thereof and to which the support members 13 for the pivot shaft 12 are secured on the other side thereof. The forward and rearward ends of the cross-member 30 are provided with depending arms 31 joined at their lowermost ends by a slightly V-shaped member 32. The central portion of the V-shaped member 32 has an integrally formed, downwardly projecting bearing 33 adapted to receive a shaft 34. The shaft 34 is axially parallel with the lengthwise dimension of the frames 5 and 6 and is disposed at right angles to the center line of the tractor 1. A heavy yoke 35 is centrally pivoted upon the shaft 34, said yoke 35 being parallel with the cross-member 30 and having slightly downwardly projecting, integrally formed bearings 36 at either end thereof. The bearings 36 are axially aligned and the axes thereof are parallel with the yoke 35 and the center line of the tractor 1.

The forward end of the yoke 35 has securely mounted thereto a leading caster 40, and the rearwardly directed end of said yoke is similarly provided with a trailing caster generally indicated at 40'. As the tractor and the mower 2 move forwardly across the ground, the casters 40 and 40' are enabled to individually follow the longitudinal contour of the ground in the direction of movement due to the pivoting action of the yoke 35 about the shaft 34 of the bearing 33.

Beneath the frames 5 and 6 and extending in either lateral direction away from the main support 9, there are provided a plurality of interhinged, individual mower units 50. Each mower unit comprises a rectangular, plate-like frame 51 having depending flanges 52 at the forward and rearward edges thereof and longitudinally disposed, upwardly formed ribs 53 adjacent either lateral edge of said frame. The power source for each mower unit comprises an electric motor 54 mounted upon the top surface of the frame 51 adapted to drive a rotary cutting blade 55 mounted on a drive shaft 56 of said motor and being disposed beneath said frame 51. As best seen in FIG. 5, the lateral edges of the frame 51 at the forward and rearward portions thereof are provided with hinge bearings 57 substantially centrally located in a line with the cutting blades, adapted to receive hinge pins 58. This preferred positioning of the hinge point between adjacent mower units permits the rotary cutting blades associated with the various mower units to function within extremely close limits up to fractions of an inch, without danger of overlap or contact between adjacent positioned blades. The two mower units positioned immediately upon either side of the main support 9 are hingedly connected to the bearings 36 of the yoke 35 by means of hinge pins 37.

Referring now to FIG. 2, it will be noted that by the hinged arrangement of the mowers as above described, each gang of mowers on either side of the main support 9 is vertically flexible whereby it can follow the contour

of the ground regardless of how irregular it may be. Said mowers are also forwardly and rearwardly tiltable due to the tilting action of the yoke 35. In this way, the mower 2 is enabled to follow the irregularities of the ground surface as the tractor moves along regardless of whether such irregularities are in a longitudinal or a lateral direction.

Referring now particularly to FIG. 5, certain of the individual mower units are preferably provided with leading casters 41 and trailing casters 41'. Every mower unit is not provided with casters, since, obviously, a mower unit which is hingedly suspended between two similar units having caster wheels will be adequately suspended above the ground and will have no need of caster wheels itself.

As herein illustrated, the main frame 5 has positioned therebeneath four individual mower units whereas the pivoted frame 6 has positioned therebeneath five such units. The number of individual mower units could vary and the numbers given here are intended as examples only. The outer mower units in either lateral direction relative to the main support 9 are provided with two leading casters 41 and one trailing caster 41'. The third mower unit inwardly from either end is similarly provided with two leading casters 41 and one trailing caster 41'. The mower unit which is attached immediately to the main support 9 and positioned under the pivoted frame 6 is provided with one leading caster 41 and one trailing caster 41'. This arrangement of casters could, of course, be varied such as by providing each mower unit with one leading and one trailing caster or by placing pairs of leading casters on each mower unit in combination with single or double casters.

The casters 40—40' and 41—41' are substantially identical in construction with the exception that the former are mounted on the yoke 35 and the latter are secured in a similar fashion to the frames 51 of the individual mower units 50. Therefore, only the casters 41—41' will be described in detail, it being understood that casters 40—40' are similarly constructed in every respect.

Referring now to FIG. 8, the casters 41—41' comprise mounting brackets 42—42' which are secured respectively to the forward and rearward ends of a frame 51 of a mower and project forwardly and rearwardly therefrom. The forward end of the bracket 42 terminates in an axially vertically disposed bearing 43 integrally formed with said bracket, and the bracket 42' is similarly provided at the rearwardly directed end thereof with a vertically disposed bearing 43'. The caster wheel supports are conventional in design comprising upwardly directed, swivel shafts 44—44' and downwardly directed, laterally curved forked wheel supports 45—45'. The wheels W—W' are pivotally mounted between the forked wheel supports 45—45' by means of axles 46—46'. It will be understood that due to the fact that the horizontal axles 46—46' are laterally offset relative to the axis of the vertical swivel shafts 44—44', the casters will individually tend to align themselves whereby the wheels W—W' always run parallel with the direction of movement of the structure which they support.

It will be noted that the swivel shafts 44—44' are provided wtih a plurality of axially evenly interspaced apertures 47—47' which are adapted to receive pins 48—48' which project through suitable apertures in the bearings 43—43'. By means of the said pins and apertures, the individual mower units can be raised or lowered relative to the ground line thereby varying the height of the cut made by the rotating blades 55 of the electric motors 54. In making such adjustments, all of the casters 40—40' and 41—41' would preferably be individually adjusted whereby every mowing unit would be cutting at the same height. However, the mowing units at one portion of the mower 2 can be set at a different height from the other

individual mowing units if so desired without interfering with the operation of the mechanism.

The individual mowing units which are positioned beneath the main frame 5 are limited in their downward movements by means of a plurality of lift rods 60. The lift rods 60 are secured at their lowermost ends to the hinge bearings 57 between each pair of mowers and project upwardly through suitable apertures in the longitudinal beams 7, the uppermost ends of said lift rods being provided with stop member to limit the downward movement thereof.

As best seen in FIG. 3, the lowermost ends of each lift rod 60 is provided with an enlarged end in the form of a bearing 61*a* through which a pin 61*b* extends, said pin also extending through ears of a short link 62*b* which in turn is secured to the hingle bearing 57 by pin 58. The pin 61*b* and pin 58 have their horizontal axes at right angles to each other and together with link 62*b* and the rod 60, provide a support for the hinge bearing 57 while allowing free tilting movement of the frames 51.

In the gang of mowers associated with the main frame 5, the individual mowing unit 50*a* which is positioned furthest from the main support 9 is provided with a lift rod 60*a* which is substantially similar to the lift rod 60. As shown in FIG. 10, the lift rod 60*a* is provided with a ball 61 and a socket housing 62—63. In the case of the mower unit 50*a* the lower housing portion 63 is mounted directly to the mower frame 51*a*. The threaded shank 63*a* of said lower housing portion projects through a suitable aperture 59 in the frame 51*a* and is provided at the lowermost end thereof with a securing nut 63*b*.

The lift rods 60 and 60*a* are mounted to both the forward and rearward ends of the individual mower units whereby they project upwardly through both of the beams 7 of the main frame 5. In FIG. 4 is shown the uppermost end of one of the said lift rods and it will be understood that all of said lift rods are slidably mounted through the beams 7 in substantially the same manner.

The beams 7 are preferably box-shaped in section thereby providing a pair of vertically interspaced, horizontally disposed wall portions, an upper wall 7*a* and a lower wall 7*b*. A lift rod 60 projects upwardly through a relatively large opening 70 in the lowermost wall 7*b* and through a relatively smaller aperture 71 in the uppermost wall 7*a*.

The relatively larger dimension of the opening 70 in the lower wall 7*b* allows the lift rod 60 to tilt away from the vertical, such tilting action being a necessary consequence of the flexing of the mower gang. As the lateral contour of the ground varies, and as the hinged, individual mower units conform thereto, the effective lateral length of the entire gang of mowers will, of course, be constantly changing. As measured from the main support 9 and proceeding laterally outwardly therefrom, the gang of hinged mowers will be longest when said mowers are riding across level ground and will become progressively shorter as the ground becomes progressively more uneven. This characteristic of the hinged mower units causes slight lateral shifting of the lower pivot points of the lift rods at the ball 61 whereby said lift rods shift slightly off the vertical when the mower is traveling over uneven ground.

Adjacent the extreme uppermost end of the lift rods 60 there is provided a sleeve-like stop member 64 which is telescoped over the upper end of the lift rod and secured thereto in any suitable manner such as by a cotter pin 65. When the individual mower units 50 and 50*a* associated with the main frame 5 move downwardly to a certain point, or when the said main frame moves upwardly a limited distance, the stop member 64 abuts the uppermost surface of the wall 7*a* and maintains the individual mower unit at one level. The purpose of the lift rods 60 and 60*a* and their associated stop members 64 will be herein later more fully described.

In the gang of mowing units 50 which extend outwardly from the main support 9 beneath the pivoted frame 6, it will be noted that the outermost mower designated 50*b*

is slightly modified relative to the other said mowers. The mower 50*b* (FIGS. 1, 2 and 9) is provided with an enlarged frame 51*b* which is substantially wider as seen from the front of the mower than the other frames 51 and 51*a*. A rod 75 is mounted upon the frame 51*b* by means of a pair of upwardly directed supports 76, said supports being secured in any suitable manner adjacent the lateral edges of said frame intermediate the forward and rearward ends thereof. The rod 75 is positioned slightly above the upper surface of the frame 51*b* and is secured at either end thereof by means of said upwardly directed supports 76. A slide member 77 is telescoped over the rod 75 and is adapted for movement within the limits of the two supports 76 which serve as stop members for said slide.

The pivoted frame 6 is provided with an additional short beam 66 which is parallel to and spaced inwardly from the short, end-beam 11 (FIG. 5). The beam 66 is welded or otherwise secured at its ends to the long beams 10, and the beams 11 and 66 are similarly interconnected by a member 67 which is parallel to the long beams 10, and is positioned centrally between said long beams.

The rod 75 is positioned directly beneath and parallel to the member 67, and the axis of said rod is aligned in a forward and rearward direction with the shaft 34 of the main support 9 as best seen in FIG. 5. The member 67 is provided with a U-shaped brace 78 having secured thereto a downwardly projecting ball 79. The ball 79 is seated within a socket portion 74 which projects upwardly from the slide member 77. The ball and socket 79—74 arrangements allow a free universal pivotal movement between the pivoted frame 6 and the outermost motor unit 50*b* whereby the said unit can tilt laterally or forwardly and rearwardly to conform to the lateral and longitudinal irregularities of the ground.

As the gang of mower units which is associated with the pivoted frame 6 effectively lengthens and shortens as the contour of the ground changes, the slide member 77 shifts along the rod 75 to accommodate such changes in length. For example, in the showing of FIG. 1, the mower units in the left hand gang are on level ground and therefore extend laterally outwardly to their furthest point. In this position the slide member 77 is positioned adjacent the right hand support 76 and most of said rod projects laterally outwardly beyond said slide member. When the gang of mowers is distributed over laterally uneven ground as shown in FIG. 2, the effective length of the gang of mowers is shortened and the slide member 77 is positioned adjacent the central portions of the rods 75.

The upwardly formed ribs 53 serve to strengthen the frames 51.

Referring now to FIG. 5, it will be further noted that the positioning of the motors 54 and their blades 55 relative to the individual mower units is staggered, alternate mower units having the motors thereof positioned forwardly with the mower units in-between having the motors thereof positioned rearwardly. The blades 55 are of such length that the cutting path of one of said blades overlaps the cutting path of the blade of the particular mower unit which is next to it. Blades of such increased size are possible due to the forward and rearward staggering of the electric motors 54 and such overlapping of the cutting paths eliminates the possibility of the mower 2 leaving ridges of uncut grass behind it.

As hereinbefore stated, the ground engaging or effective weight of the main frame 5 and the pivoted frame 6 is carried by the casters 40—40' of the main support 9. However, the actual weight of said frame is preferably less than the effective weight which presses against the ground, the actual weight being partially offset by means of a counterbalance spring 80, as best shown in FIG. 1.

The spring 80 is secured at the lowermost end thereof to a web 81 which extends horizontally between and is secured at either end to the movable supports 17 and 17'. The web 81 is provided with an upwardly projecting eye 81*a* into which the lowermost end of the spring 80 is hooked. The upper end of said spring 80 is secured by means of an adjustable eye bolt 82 to the cross beam 20 which horizontally connects the uppermost ends of the guides 19—19'.

The eye bolt 82 is provided with an adjusting nut 83 by which the tension of the spring 80 may be varied to counter-balance the weight of the frames 5 and 6 to the desired degree. In this way the casters 40—40' and the main support 9 are protected against overloading which might cause the wheels W—W' of the casters 40—40' to sink into the ground due to the excessive pressure exerted thereon.

In ordinary operation, therefore, the tractor 1 propels the mower 2 across the ground with each of the mower units being operated individually by its respective electric motor 54. The main frame 5 is in a lowered position whereby the weight thereof, effectively counterbalanced by the spring 80, rests upon the forward and rearward casters 40 and 40'. The pivoted frame 6 is in a relaxed condition whereby it may pivot upwardly or downwardly as the outboard mower unit 50*b* moves up and down across the terrain. All of the other mowers, due to their interhinged relationship, automatically conform to the lateral shape of the ground, intermittently changing their effective length very slightly as the ground line changes and thereby effectively and efficiently mowing a relatively wide path of the grass. It will be readily seen that this mower is particularly effective for mowing the bottoms of roadside drainage ditches or for steeply banked areas. The pivoted frame 6 is capable of pivoting upwardly to any desired angle whereby extremely difficult, steep areas may be effectively mowed, and the mower gang associated therewith can flex or bow downwardly to accommodate to sharp depressions in the ground.

To effect the raising and lowering of the main frame 5 and its associated mowing units there is provided a lift cylinder 90. The lift cylinder 90 is secured at the uppermost end thereof to a laterally outwardly projecting end portion 20*a* of the cross beam 20 and is provided with a downwardly directed piston rod 91 secured at its lowermost end to a laterally projecting arm 17*a* of the movable support 17. By means of the lift cylinder 90, the movable support 17 and the support 17' connected thereto through the web 81 are raised or lowered. The lift forks 14—14' are thereby also raised or lowered and consequently the main frame 5 is similarly vertically moved.

The pivoted frame 6 is pivotally raised by means of a pivot cylinder 92 which is secured at one end thereof to a forwardly projecting brace 84 mounted to the web 81. The pivot cylinder 92 has a longitudinally movable piston rod 93 which projects laterally and slightly downwardly and is pivotally connected to an upstanding pair of arms 6*a* which project upwardly from the rearwardly disposed beam 10 of the pivoted frame 6. The arms 6*a* are spaced laterally a short distance from the pivot shaft 12 upon which the frame 6 pivots. By contracting the cylinder 92, the frame 6 may be pivoted upwardly and toward the main frame 5 as illustrated in FIG. 9.

The cylinders 90 and 92 are conventional single acting cylinders adapted to raise their respective frames when hydraulic pressure is applied thereto to pull the respective piston rods 91 and 93 inwardly. When the hydraulic pressure is released, the fluid which is exhausted from the cylinder is so metered out as to allow the respective frames to settle gently to the ground.

Referring now to FIG. 5, the tractor 1 is provided with a generator as indicated at 100 and a suitable hydraulic power source as indicated at 101. These two units may be of conventional design and are not herein illustrated in detail. It is to be assumed that power for running the generator 100 and the hydraulic power unit 101 could be taken from the tractor motor itself or be

provided by a separate, small gasoline engine or the like.

Current from the generator 100 passes through suitable electrical conduits as indicated at 102 to a control panel 103 located on the right side and within reach of a driver seated upon the seat 3. Line 104 connects the control panel 103 with the mower units, said line 104 branching into and comprising two electrical circuits 104*a* and 104*b*. The circuit 104*a* provides electrical current to the four individual mower units 50 which are connected to and positioned beneath the main frame 5. The circuit 104*b* provides electrical current to the five individual mower units which are connected to and positioned beneath the pivot frame 6.

The control panel 103 is provided with two pairs of on and off control buttons 103*a*—103*a* and 103*b*—103*b*. The control buttons 103*a*—103*a* are adapted to make or break the circuit 104*a* leading to the mower units associated with the main frame 5; the control buttons 103*b*—103*b* are adapted to make and break the circuit 104*b* leading to the mower units associated with the pivoted frame 6. It will be readily seen, therefore, that each gang of mowers is individually actuable and may be operated separately or in unison.

Fluid from the hydraulic power source 101 is directed through a suitable tube 105 to a pair of valve control means 106 and 107. By means of the valve control means 106 fluid is delivered through a hydraulic line 106*a* to the lift cylinder 90 for raising the main frame 5. Similarly, by means of the valve 107 fluid is delivered to the pivot cylinder 92 through a line 107*a* to cause the frame 6 to pivot upwardly.

The present mower 2 may be used in either of two ways. If a particularly wide area is to be cut, the mower is used in the ordinary way hereinbefore described with the pivoted frame 6 in its downward position and with both gangs of mowers running. If, however, it is desired to mow a relatively narrow path, the pivoted frame 6 is raised to the position as shown in FIG. 9 with, however, the main frame 5 is being left in a lowered position as shown in FIG. 1. The gang of mowers associated with the pivoted frame 6 are turned off by means of the "off" control of the switch 103*b* and only that gang of mowers associated with the main frame 5 is used for cutting. Thus, the mower 2 is readily adaptable for cutting both wide and relatively narrow strips of grass.

When it is desired to move the entire mower 2 from one work area to another, said mower is adjusted to the position shown in FIG. 9, whereby both the pivot cylinder 92 and the lift cylinder 90 are actuated. This pivots the frame 6 upwardly to the position shown in FIG. 9 and raises the main frame 5 whereby, by means of the lift rods 60 and 60*a*, those mower units associated with said main frame are raised a substantial distance off of the ground. With both frames and their associated mowers in the raised position, the tractor may be driven along a highway in the normal manner of road type vehicles.

The lateral positioning of the lift cylinder 90 is such that the frames 5 and 6 and their associated parts are substantially evenly distributed in their weight on either side of the center line of said cylinder. Also, the counterbalance spring 80 is preferably closely adjacent to the point of balance between the frames when both frames are lowered and in the normal running position.

By referring to FIG. 9, it will be noted that when the frame 6 is in the raised position, the slide member 77 is moved laterally outwardly along the rod 75 until it abuts the outermost support 76. The outermost support 76 is so positioned relative to the point where the innermost mower is pivoted to the main support 9 as to cause the intervening hinged mowers to be sufficiently tensioned to prevent undue sag therein when the pivoted frame 6 is raised to its uppermost position. This prevents undue swaying of the mowers with the consequent possibility of damaging the same.

It is anticipated that the pivoted frame 6 could project laterally from either side of the tractor, be angled with respect thereto, etc. but it is preferable that it project, as herein illustrated, to the right of the tractor whereby it would provide no obstacle to oncoming traffic when traveling along the highway in the adjusted position of FIG. 9.

It is also to be understood that variations in the modification disclosed could be made, as for example, an adaptation to a relatively small mower construction, wherein only a few mower units having the vertical flexibility and forward and rearward tilting of the present invention would be employed.

It will also be understood that many departures from the details of this invention as herein described and illustrated may be made without, however, departing from the spirit thereof or the scope of the appended claims.

What I claim is:

1. A grass mower for attaching to a vehicle comprising a plurality of individual mower units, each of said units having its own source of power and a blade actuable by said source of power, means hingedly securing said units to said vehicle and each other, said hinge means being in the plane of the rotary cutting blades, means associated with said units and said vehicle adapted to vertically displace and longitudinally tilt said units with respect to the ground and in relation to said vehicle.

2. A grass mower for attaching to a moving vehicle comprising at least two individual mower units, a support vertically movably mounted on said vehicle, wheel means carried by said support whereby said support is in rolling contact with the ground, said support being forwardly and rearwardly flexible in the direction of movement of said vehicle, each said individual mower unit hingedly connected along one lateral side thereof to said support, one of said units being positioned on one side of said support and the other said unit being positioned on the other side of said support, and additional wheel means mounted on said individual mower units for rolling contact with the ground.

3. A grass mower as set forth in claim 2, comprising lift means associated with said vehicle and with said individual mower units for separately lifting said units off of the ground.

4. A gang-type grass mower attached to a vehicle comprising a horizontally disposed, vertically movable frame mounted on said vehicle, a support mounted on one end of said frame having ground engaging wheel means, said frame angularly disposed relative to the direction of movement of said vehicle, a mower gang pivoted at one end to said support and extending therefrom beneath said frame, said gang comprising a plurality of laterally interhinged mowing units, said units having wheel means for rolling contact with the ground, lift means connecting said gang with said frame, said gang being vertically flexible to conform to the lateral contour of the ground, and power means associated with said vehicle and said frame for lifting said frame to raise said gang above the ground.

5. A gang-type grass mower attached to a vehicle comprising a vertically movable support, means for vertically movably mounting said support to said vehicle, said support having ground engaging wheel means, a frame pivoted at one end to said support to pivot upwardly, said frame disposed angularly to the direction of movement of said vehicle, a mower gang pivoted at one end thereof to said support and positioned beneath said frame, the axis of the pivot of said mower gang being parallel to the pivotal axis of said frame, said gang comprising a plurality of laterally interhinged mowing units, said gang having wheel means for rolling contact with the ground, lift means connecting said gang with said frame, said gang

being vertically flexible to conform to the lateral contour of the ground, and power means associated with said vehicle and said frame for pivoting said frame upwardly.

6. A gang-type grass mower attached to a vehicle comprising a support mounted to said vehicle, said support having ground engaging wheel means, a frame pivoted at one end to said support to pivot upwardly therefrom, said frame disposed angularly to the direction of movement of said vehicle, a mower gang pivoted at one end thereof to said support and positioned beneath said frame, the axis of the pivot of said mower gang being parallel to the pivotal axis of said frame, said gang comprising a plurality of laterally interhinged mowing units, said gang having wheel means for rolling contact with the ground, slidable connection means connecting a mowing unit of said gang which is disposed outermost from said support to said frame whereby said outermost mowing unit is movable toward and away from said support, said slidable connection having stop means limiting the movement of said outermost mowing unit.

7. A gang-type grass mower as set forth in claim 6 whereby the recited slidable connection means comprises a slide member slidably mounted to said outermost mowing unit and universal pivot means connecting said slide member to said frame whereby said outermost mowing unit is tiltable in both a lateral and a forward and rearward direction.

8. A gang-type grass mower attached to a vehicle comprising a horizontally disposed, vertically movable frame mounted to said vehicle, a support mounted to one end of said frame having ground engaging wheel means, a second frame pivoted to said support and aligned with said first frame, said frames disposed angularly to the direction of movement of said vehicle, a pair of mower gangs each pivoted at one end thereof to said support and extending laterally outwardly therefrom beneath one of said frames, each gang comprising a plurality of laterally interhinged mowing units, each said gang having wheel means for rolling engagement with the ground, means connecting each said gang with its respective frame, each said gang being vertically flexible to conform to the lateral contour of the ground, and power means associated with said vehicle and said frames including means for pivoting said second frame upwardly towards said first mentioned frame and means for lifting said first mentioned frame.

9. A gang-type grass mower for attaching to one end of a vehicle comprising a vertically movable, lift-fork mechanism mounted to said vehicle, a first frame secured horizontally across said lift-fork mechanism, a support mounted to one end of said first frame having means associated therewith for rolling engagement with a ground surface, a second frame pivoted to said support and aligned with said first frame, said frames disposed at right angles to the direction of movement of said vehicle, a pair of mower gangs each pivoted at one end thereof to said support and extending laterally outwardly therefrom beneath one of said frames, each said gang comprising a plurality of laterally interhinged, individual mower units, each said gang having wheel means for rolling engagement with said ground surface, means connecting each said gang with its respective frame, each gang being vertically flexibly movable to conform to the lateral contour of said ground surface, power means for pivoting said second frame whereby it folds upwardly toward said first frame, said first frame vertically movable by said lift-fork mechanism.

10. A gang-type grass mower vertically movably mounted to a vehicle comprising a lift mechanism, a frame horizontally secured to said lift mechanism, said frame being longitudinally disposed at right angles to the direction of travel of said vehicle, a support mounted to one end of said frame, said support comprising an upper and a lower portion, said upper portion being rigidly fixed to said frame, said lower portion being pivoted to said upper portion about an axis parallel with said frame, a second frame pivoted to said upper portion of said support and directed oppositely from said first mentioned frame, a pair of mower gangs each pivoted at one end thereof to said lower portion of said support about an axis parallel to the direction of movement of said vehicle and extending laterally outwardly therefrom beneath one of said frames, each said gang comprising a plurality of laterally interhinged mowing units, each said gang having wheel means for rolling engagement with the ground, lift means connecting each said gang with its respective frame, each said gang being vertically flexible to conform to the lateral contour of the ground, and power means associated with said vehicle and said frames including means for pivoting said second frame upwardly toward said first mentioned frame and means for lifting said first mentioned frame.

11. A gang-type grass mower vertically movably mounted to a vehicle comprising a lift mechanism, a frame horizontally secured to said lift mechanism, said frame being longitudinally disposed at right angles to the direction of travel of said vehicle, a support mounted to one end of said frame having ground engaging wheel means, a second frame pivoted to said support and directed oppositely from said first frame, a first gang of mowers hinged at one end to said support and extending beneath said first frame and a second gang of mowers hinged at one end to said support and extending beneath said second frame, each said gang comprising a plurality of laterally interhinged mowing units, each said gang having wheels means for rolling engagement with the ground, a plurality of lift rods pivotally secured to said first gang, said lift rods projecting upwardly through and slidably mounted on said first frame, said lift rods having stop means limiting the downward movements thereof, the outermost mowing unit of said second gang being secured to said second frame adjacent the outermost end of said second frame by a slidable connection means, said connection means providing for slidable and pivotable movement of said outermost mowing unit relative to said second frame, each said gang being vertically flexible to conform to the contour of the ground, and power means associated with said vehicle and said frames including means for pivoting said second frame upwardly toward said first mentioned frame and means actuating said lift mechanism to raise said first frame whereby all of said individual mowing units are raised above the ground.

12. A gang-type grass mower vertically movably mounted to a vehicle comprising a lift mechanism, a frame horizontally secured to said lift mechanism, said frame being longitudinally disposed at right angles to the direction of travel of said vehicle, a support mounted to one end of said frame, said support comprising an upper and a lower portion, said upper portion being rigidly fixed to said frame, said lower portion being pivoted to said upper portion about an axis parallel with said frame, a second frame pivoted to said upper portion of said support and directed oppositely from said first mentioned frame, a first gang of mowers hinged at one end to said lower portion of said support and extending beneath said first frame and a second gang of mowers hinged at one end to said lower support and extending beneath said second frame, each said gang comprising a plurality of laterally interhinged mowing units, each gang having wheel means for rolling engagement with the ground, a plurality of lift rods pivotally secured to said first gang, said lift rods projecting upwardly and slidably mounted to said first frame, said lift rods having stop means limiting the downward movements thereof, an outermost mowing unit of said second gang being secured to said second frame adjacent an outermost end of said second frame by slide means, said slide means slidably mounted to said outermost mowing unit and movable in a direction parallel

with said second frame, said slide means pivotally connected to said second frame, each said gang being vertically flexible and forwardly and rearwardly tiltable to conform to the contour of the ground, and power means associated with said vehicle and said frames including means for pivoting said second frame upwardly toward said first mentioned frame and means actuating said lift mechanism to raise said first frame whereby all of said individual mowing units are raised above the ground.

13. A gang-type grass mower comprising a lift mechanism attached to a vehicle, said lift mechanism comprising guide means rigidly fixed to said vehicle, vertically movable support means mounted on said guide means, a first frame secured horizontally to said movable support means, a support mounted on one end of said first frame having means associated therewith for rolling engagement wth a ground surface, a second frame pivoted to said support and directed oppositely from said first frame, said frames disposed at right angles to the direction of movement of said vehicle, a pair of mower gangs each pivoted at one end thereof to said support and extended laterally outwardly therefrom beneath said frames, each said gang comprising a plurality of laterally interhinged, individual mower units, each said gang having wheel means for rolling engagement with said ground surface, lift means connecting each said gang with its respective frame, each gang being vertically flexibly movable to conform to the contour of said ground surface, actuating means connected to said guide means and said movable support means and vertically moving said first frame, and actuating means connected to said movable support means and said second frame and pivoting said second frame upwardly toward said first frame.

14. A gang-type grass mower comprising a lift mechanism attached to a vehicle, said lift mechanism comprising guide means rigidly fixed to said vehicle, vertically movable support means mounted to said guide means, a rectangular frame mounted to said movable support means, said frame positioned in a horizontal plane with the longitudinal dimension thereof disposed at right angles to the direction of travel of said vehicle, a support mounted to one end of said first frame having means associated therewith for rolling engagement with a ground surface, a second rectangular frame longitudinally aligned with said first mentioned frame and pivotally mounted to said support opposite said first frame, said second frame pivotal about an axis disposed parallel to the direction of travel to said vehicle, a first gang of mowers hinged at one end to said support and extending beneath said first mentioned frame and a second gang of mowers hinged at one end to said support and extending beneath said second frame, each said gang comprising a plurality of laterally interhinged mowing units, each said gang having wheel means for rolling engagement with the ground, a plurality of lift rods pivotally secured to said first gang, said lift rods projecting upwardly and slidably mounted to said first mentioned frame, said lift rods having stop means limiting the downward movements thereof, an outermost mowing unit of said second gang being secured to said second frame adjacent an outermost end of said second frame by slide means, said slide means connecting said second frame and said outermost mowing unit by being slidably mounted to one of said elements, and pivotally mounted to the other of said elements, each said gang being vertically flexible to conform to the contour of the ground, actuating means connected to said guide means and said movable support means and vertically moving said first frame, and actuating means connected to said movable support means and said second frame and pivoting said second frame upwardly toward said first frame.

15. A gang-type mower for attaching to one end of a tractor comprising a lift-fork mechanism, said lift-fork mechanism comprising fixed guide means and vertically movable support means movable on said guide means, a pair of forks projecting substantially horizontally from said movable support means, a horizontal frame mounted upon said forks and longitudinally disposed at right angles to the direction of travel of said tractor, a main support secured to one end of said frame, said main support comprising upper and lower relatively pivoted portions, said upper portion fixed to said frame and said lower portion pivotal about an axis parallel with the longitudinal dimension of said frame, a second frame pivoted to said upper portion and directed oppositely from said first mentioned frame, said lower portion of said main support having ground engaging wheels associated therewith, a first gang of mowers hinged at one end to said lower portion of said support and extending beneath said first frame and a second gang of mowers hinged at one end to said lower support and extending beneath said second frame, each said gang comprising a plurality of laterally interhinged mowing units, each said gang having wheel means for rolling engagement with the ground, a plurality of lift rods pivotally secured to said first gang, said lift rods projecting upwardly and slidably mounted to said first frame, said lift rods having stop means limiting the downward movements thereof, an outermost mowing unit of said second gang being secured to said second frame adjacent an outermost end of said second frame by slide means, said slide means slidably mounted to said outermost mowing unit and movable in a direction parallel with said second frame, said slide means pivotally connected to said second frame, each said gang being vertically flexible and forwardly and rearwardly tiltable to conform to the contour of the ground, actuating means connected to said guide means and said movable support means and vertically moving said forks and said first mentioned frame, actuating means connecting said movable support means to said second frame and pivoting said second frame upwardly toward said first frame, and counterbalance means connecting said guide means and said vertically movable support means for partially supporting the weight of said frames.

16. A grass mower for attaching to a vehicle comprising a plurality of individual mower units, each of said units comprising a frame, a source of power, blade means actuated by said power source, said rotary blade means disposed downwardly from said frame and rotating in a plane substantially parallel to said frame, bearing means extending outwardly from portions of the edges of said frame, said bearing means being in the same plane as said blade means, pin means associated with the bearing means of adjacent frames whereby said frames are pivotably mounted relative to each other, said pin means being in the same plane as said blade means, whereby said blade means, upon actuation of said power source, can move in the longitudinal plane through said pin means thereby allowing the blade means of adjacent units to operate within close limits.

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